MIDWEST AIRSPACE PLAN ENVIRONMENTAL ASSESSMENT

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FEDERAL AVIATION ADMINISTRATION
800 INDEPENDENCE AVE SW
WASHINGTON, DC. 20591

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CHAPTER I – PROJECT BACKGROUND AND PURPOSE AND NEED FOR THE ACTION

1.1 INTRODUCTION

In April of 1996, the FAA Administrator announced that the FAA would begin a comprehensive review and redesign of the United States Airspace. This endeavor became known as the National Airspace Redesign (NAR) project. The essence of NAR was to review all national airspace resources to determine if they provided for an efficient national airspace system. The goal of NAR was to: (1) increase system flexibility, predictability, and access; (2) maintain and improve system safety; (3) improve efficiency and reduce delays; and (4) support the evolution of emerging technologies. Each FAA region was tasked with identifying any national airspace system resources that needed to function more effectively and examine alternatives to correct any noted deficiencies.

The air traffic control procedures and airspace modifications proposed for the St. Louis Terminal Radar Approach Control (TRACON) airspace, termed as the Midwest Airspace Plan (MAP), are analyzed for their potential environmental impacts within this document. This environmental assessment (EA) evaluates the MAP project with respect to the environmental resource categories required by Federal law and regulation. It has been prepared pursuant to the requirements of the National Environmental Policy Act (NEPA) of 1969 (P.L. 91-190, 32 U.S.C. 3321 et. Seq.), the Federal Aviation Act of 1958 (Recodified as 49 U.S.C. Section 40101 et. Seq.), the Airport and Airway Improvement Act of 1987 (Recodified as 49 U.S.C. Section 47101, PL 97-238), and other laws as applicable. Additionally, the format and subject matter included in this document conforms to the requirements and standards of the FAA as set forth in FAA Order 1050.1E, *Environmental Impacts: Policies and Procedures*. Guidance provided in FAA Order 5050.4A, the *Airport Environmental Handbook*, has also been relied upon where relevant.

1.2 BACKGROUND

The FAA issued a Final Environmental Impact Statement (FEIS) for various airport improvement projects for the Lambert-St. Louis International Airport (STL) in December of 1997. The airport improvement projects included construction and operation of a new staggered parallel runway (Runway 11/29), designated as W-1W. The FEIS evaluated the potential environmental impacts from the construction and operation of the new runway as well as the new traffic patterns that would be used in the immediate vicinity of the airport once the new runway was commissioned. The impact analysis in the FEIS considered use of the airspace within an approximate five mile radius of the airport. These projects were approved in a subsequent Record of Decision (ROD), dated, September 30, 1998.

The MAP project is predicated on the runway use assumptions relied upon in the FEIS. The MAP project seeks solely to fashion an integrated regional airspace design and to implement air traffic control procedures that befit the airport in its new configuration with the W-1W runway, as well as to address any airspace or procedural inefficiencies identified through the NAR process. As such, the runway use assumptions set forth in the W-1W FEIS remain valid. Additionally, noise abatement procedures used at the present time will remain in effect when considering potential regional airspace design alternatives.

FIGURE 1-1. MAP STUDY AREA

This EA is being prepared in anticipation of the commissioning of the new W-1W runway in mid-2006. The MAP study area includes portions of two states – Missouri and Illinois. Specifically, it encompasses the geographical area within a 75 nautical mile radius of STL, from the ground to 18,000 feet mean sea level (msl). The study area includes all areas where there is a potential for environmental impacts. Figure 1-1 illustrates the MAP study area. This includes aircraft flying to/from STL, four reliever airports (Spirit of St. Louis Airport (SUS), St. Louis Downtown Airport (CPS), St. Louis Regional Airport (ALN), and Scott Air Force Base/Mid-America Airport (BLV), as well as over-flight traffic (i.e., aircraft transiting the study area). The airports which have the potential to be affected by MAP are depicted in bold type. The MAP would only affect aircraft flying under Instrument Flight Rules (IFR) to/from these airports.

This EA evaluates the No-Action, otherwise know as the future baseline, as well as three airspace redesign alternatives for the 2006, the implementation year, and 2013. The main focus of the proposed project is establishment of new ingress and egress fixes and routes at the lateral boundaries of the St. Louis TRACON airspace, located approximately 40 miles from STL. This EA addresses the potential impacts of integrating the redesigned St. Louis TRACON airspace into the larger Kansas City Center airspace as well as integrating reliever airport flows and over-flight procedures into an operationally flexible air traffic control system.

1.3 AIR TRAFFIC CONTROL – A GENERAL OVERVIEW

Air traffic controllers in three different types of facilities are responsible for separation of traffic. They are Air Route Traffic Control Centers (Centers), Terminal Radar Approach Control (TRACON), and Airport Traffic Control Towers (ATCTs). Control responsibility for aircraft is transferred from facility to facility as an aircraft departs its point of origin until it reaches its destination.

There are 21 Centers throughout the United states according to the March, 2005 FAA Administrator Fact Book. Centers are primarily responsible for control of aircraft during the high altitude en route phase of flight. Kansas City Center has responsibility for separation services in portions of Illinois, Missouri, Oklahoma, Texas, Louisiana, Arkansas, Mississippi, Alabama, Tennessee, and Kentucky at altitudes generally above 15,000 feet. This project addresses the role Kansas City Center (ZKC) has with regard to how traffic arrives and departs the St. Louis TRACON airspace at approximately 40 miles from STL, at altitudes of approximately 15,000 feet. Among their many duties, Kansas City Center controllers establish the initial sequence of traffic destined to land at St. Louis area airports, prior to transfer of control to St. Louis TRACON.

TRACON facilities are responsible for aircraft operations in the general vicinity of one or more airports. St. Louis TRACON airspace encompasses an area within an approximate 40 mile radius of STL. As such TRACON controllers are not only responsible for aircraft operating to/from STL, they have control responsibility for aircraft to/from many reliever airports as well. After Kansas City Center transfers control of arriving aircraft to the TRACON, controllers then assign and direct aircraft to a specific runway at the desired destination airport. Conversely St. Louis TRACON controllers provide initial sequencing and separation of departing aircraft before transferring control to Kansas City Center controllers, who then direct the aircraft toward their destination.

Controllers in ATCTs are responsible for providing control services to aircraft operating in the immediate vicinity of a particular airport or on airport property. Tower controller's direct aircraft as they taxi to/from runways and clear aircraft to takeoff and land. St. Louis ATCT controllers are responsible for aircraft operations from the ground to 3,000 feet within an approximate six nautical mile radius of STL.

As previously stated, the main focus of the MAP project is on the ingress/egress fixes used for

STL. It also addresses proposed changes to aircraft departing/destined to the following four reliever airports: SUS, CPS, ALN, and BLV.

1.4 PURPOSE AND NEED

The St. Louis area airspace was designed in the 1960's. Due to the volume of traffic and the fact that flight characteristics of aircraft have significantly changed in the past 40 years, the existing airspace structure no longer efficiently accommodates air traffic. This is particularly true during inclement weather conditions. Operation of the new W-1W runway will make these inefficiencies even more pronounced because the runway use patterns do not merge well with the current TRACON airspace routes farther from the airport.

As such, the purpose and need for the project is to design airspace and procedures which (1) allow air traffic control personnel to take full advantage of increased capacity associated with the new runway and (2) correct inefficiencies associated with an obsolete airspace structure.

In formulating the project alternatives, the airspace redesign team sought use of the highest altitudes and most direct routings possible. Use of higher altitudes provides greater economic benefits to aircraft operators while providing the potential to reduce noise impacts. Additionally, changes to routes and procedures within a defined airspace area have the potential to cause changes in adjacent airspace areas. As such, the design team was mindful to limit the scope of their proposed alternatives so that MAP did not cause changes to be made to the procedures and routes in other areas of the national airspace. The benefits of the MAP project include decreased delays for the flying public; increased ability to accommodate future traffic growth, including future hubbing should it occur; maximize the efficiency and capacity enhancements offered by the new W-1W runway; and optimizing environmental benefit, where possible, for citizens located in the project area.

1.5 FUTURE AIRSPACE DEMAND

In an effort to reduce delays and to meet future traffic demands, the City of St. Louis proposed airport improvement projects including terminal expansion, roadway improvements, and the construction of a third parallel runway. The potential environmental impacts from these actions were evaluated in a 1977 EIS and subsequently approved in a 1998 ROD. The FEIS originally estimated that the project would produce an annual cost savings of 297 million dollars by 2015.

The events of September 11, 2001, military conflict in Afghanistan and Iraq, the outbreak of Severe Acute Respiratory Syndrome (SARS), formation of the Transportation Security Administration (TSA), and a weakened global economy has had significant effects on the air transportation industry. These factors have led to reduced operations at STL and some other airports nationwide. Additionally, the sale of Trans World Airlines to American Airlines and the subsequent decision by American Airlines to reduce operations at STL has resulted in a further decrease in the number of flights at STL.

Despite these events, the numbers of aircraft operations has grown at airports nationwide, including STL, and are forecast to continue to grow. The FAA Administrator, Marion Blakey, stated in her December 2002 letter to the aviation community, "When the volume of air traffic comes back, and it will, we will be ready with an advanced and flexible system that provides more choices to airlines, industry, and the flying public."

As such, the purpose and need for this proposed project remains valid. The project will allow air traffic control personnel to take full advantage of the increased capacity associated with the new runway and correct inefficiencies associated with the obsolete airspace structure.

CHAPTER II – ALTERNATIVES

Council on Environmental Quality (CEQ) regulations for implementing the National Environmental Policy Act (40 CFR Part 1502, Section 1502.14) and FAA regulations (FAA Order 1050.1E, paragraph 506e and FAA Order 5050.4A, paragraph 83) require that an agency (1) rigorously explore and objectively evaluate all prudent, feasible, reasonable, and practical alternatives, including alternatives not within the jurisdiction of the Federal agency; and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated; and (2) devote substantial treatment to each alternative considered in detail, including the Future Baseline and the preferred alternative, so that reviewers may evaluate their comparative merits. Such examination ensures that an alternative that addresses the project's purpose and need, that might enhance environmental quality or have a less detrimental effect, has not been prematurely dismissed from consideration.

The options available to meet the purpose and need of the project can be grouped into five categories of alternatives: (1) Alternative Modes of Transportation and Communication; (2) Changes in Airport Use; (3) Activity or Demand Management; (4) Improved Air Traffic Control Technology; and, (5) Airspace and Air Traffic Control Modifications.

2.1 SCREENING ANALYSIS OF POTENTIAL ALTERNATIVES

As presented in Chapter 1, the purpose and need of the proposed project is to (1) allow air traffic control personnel to take full advantage of increased capacity associated with the runway and (2) correct inefficiencies associated with an obsolete airspace structure.

Each of the potential alternatives was evaluated with regard to specific criteria. They wee:

- Ability to benefit all St. Louis TRACON and Kansas City Center aviation users – including STL jets, satellite airport traffic, turboprops, props, over-flights and military aircraft.
- Minimal impact to adjacent Centers, TRACONs and ATCTs.
- Maintain/Increase the number of routes into and out of the St. Louis TRACON airspace.
- Reduce complexity of Kansas City Center east end airspace.
- Optimize use of new STL runway W-1W.
- As traffic volume and complexity increase, procedures and airspace must be able to accommodate aircraft safely and efficiently.

Alternatives were evaluated with regard to meeting the purpose and need of the project, satisfying the screening criteria, and meeting financial considerations. The screening criteria are presented in Table 2-1.

TABLE 2-1. PROJECT ALTERNATIVES GOALS AND DEFINITIONS

Project Alternatives Evaluation Categories/Goals	Project Alternatives Goal Definitions
Operational Viability (OV) Goals	Operational viability simply refers to whether a particular airspace design is workable and thus, safe. This gauge of system safety reflects the potential to maintain standards that define spacing between multiple aircraft, aircraft and other physical structures, and aircraft and designated airspace. The viability indicators that will be used in the St. Louis Metropolitan Airspace Redesign are described below.
OV Goal 1: Reduce Complexity	Airspace complexity is often considered an important issue when airspace performance is assessed and sectors and routes are evaluated for redesign. While air traffic controllers can easily identify a busy, complex sector when they see one, it is more difficult to define complexity in a strict analytic form. Traffic density, usually expressed as number of aircraft in a given time period per piece of airspace (i.e., sector), remains a common and simple metric for complexity.
OV Goal 2: Reduce Voice Communications	Congested, complex airspace often requires the controller to increase the number of advisories, clearances, and control instructions given to aircraft (needed to manage the operations). Increased numbers of discreet radio communication transmissions may also increase the possibility and frequency of blocked communications (results when two or more pilots try to communicate with a controller). Improved airspace design and routing can minimize vectoring and/or communications between the flight crews and the ATC specialists. Average controller coordination actions can be used to estimate potential reduction in voice communications.
OV Goal 3: Foster Ease of Implementation	Operational ATC airspace changes that require significant procedural change between separate facilities and associated inter-facility Letters of Agreement can prove to be problematic given the maturity of various adjacent airspace redesign activities and the coordination required between stakeholders to ensure these changes can be implemented. Some airspace redesign alternatives can be designed to mitigate the impact to these inter-facility airspace adjacencies, thereby making ease of implementation greater than would be possible with more significant changes to inter-facility transfer of control points and associated procedures.
Operational Efficiency (OEF) Goals	Operational efficiency refers to the how well a particular design works. The efficiency indicators that will be used in the St. Louis Metropolitan Airspace Redesign are described below and on the following page.
OEF Goal 1: Reduce Delay	Operational efficiency can be primarily measured by the change in delay. Delays result when an activity is not completed in the planned, expected, or scheduled time. Several definitions of delay metrics have been used in the aviation community, varying with the data available and purpose of the study. The definition of "delay" that meets our need is the difference in two simulated flight times. This definition of delay includes the difference in flight time due to changes in routing, the time spent in holding, and extra time due to vectoring. The result is an overall measure of efficiency from the user's point of view.

Source: Operational Evolution Plan, (OEP); Airspace Management Handbook – Metrics;

TABLE 2-1 (CONT). PROJECT ALTERNATIVES GOALS AND DEFINITIONS

Project Alternatives Evaluation Categories/Goals	Project Alternatives Goal Definitions
Operational Efficiency Goals (OEF Continued)	Operational efficiency refers to the how well a particular design works. The efficiency indicators that will be used in the St. Louis Metropolitan Airspace Redesign are described below.
OEF Goal 2: Balance Controller Workload	Balancing controller workload is critical in maintaining an efficient operation. In order to preserve safety, restrictions are often put in place to manage traffic loads in an overtaxed sector. These restrictions can include additional miles-in-trail (increased distance between aircraft following each other) and time-based metering (additional time between aircraft following each other). Fix loading and sector loading will be used to examine how each airspace design balances workload.
OEF Goal 3: Meet System Demands	Meeting the projected growth of traffic is an important objective. With the new STL Runway 11/29, improving the airspace structure will allow for the full use of the new runway during instrument meteorological conditions (IMC). Airport throughput and delays will be used as the primary method to evaluate how well each proposed airspace design handles future traffic increases.
OEF Goal 4: Improve User Access to the System	Metrics representing the ability of users to act on or obtain services on demand measure user access to the airspace. These measures reflect the quality and level of service, as well as the availability of system resources. Airport throughput and delays will also be used to evaluate how well each proposed airspace design provides access to the system.
OEF Goal 5: Expedite Arrivals and Departures	In complex terminal airspace, arrival and departure procedures overlap and are interdependent. These routes share common departure fixes or arrival fixes that must service a variety of aircraft types with different performance characteristics. By requiring departures to navigate or funnel through common departure fixes, the throughput rates at the airports involved must be suppressed. Similar problems exist with arrivals. Time and distance in area immediately surrounding the airport will be used to determine how expeditiously aircraft can traverse this airspace.
OEF Goal 6: Increase Flexibility in Routing	Flexibility indicators are measures of the ability of the airspace to meet users' changing needs. Flexible routing easily permits aviation users to adapt their operations to changing operational conditions (e.g., a shift in the jet steam or to avoid severe weather). Air carriers, business flyers and general aviation have identified the need to minimize the distance flown into and out of the busy Northeast. For this study, flexibility will be measured by comparing route distances.
OEF Goal 7: Maintain Airport Throughput	The airspace surrounding an airport supports the runways with arrival and departure paths. Often the capacity of the runway limits the capacity of the airport. In some instances the capacity of the airspace, as defined by the routes into and out of the airport, limits the throughput of the airport. Each of the proposed airspace designs will be examined to determine how well the proposed route structure supports the prescribed runway capacity – thus maintaining a steady stream of aircraft on the runways.

Source: Operational Evolution Plan, (OEP); Airspace Management Handbook – Metrics;

2.1.1 Alternatives Examined and Rejected from Further Consideration

Several categories of alternatives were eliminated early in the NEPA process because they did not meet the purpose and need of the project. The categories of alternatives eliminated from detailed study are listed below. None of these alternatives would allow air traffic control personnel to take full advantage of increased capacity associated with the runway or would correct inefficiencies associated with an obsolete airspace structure.

- Alternative Modes of Transportation and Communication – These include travel by automobile, truck and rail, as well as use of telecommunication such as videoconferencing.

- Changes in Airport Use – These alternatives include the use of other airports, airport capacity enhancements, or new airport construction to potentially alleviate air traffic congestion.

- Activity or Demand Management – These alternatives involve pricing or regulatory actions by airport operators or the Federal government to reduce loading of the air traffic system.

- Improved Air Traffic Control Technology – These include new air traffic control technologies which may have the potential to improve traffic flows.

2.1.2 Alternative Airspace and Air Traffic Control Modifications

The MAP team members initially considered several preliminary airspace design alternative plans. One of these initial airspace redesign considerations focused on a corner post system similar to what is currently used by the Atlanta and Dallas TRACONs.

In a corner post system, arriving aircraft would be routed to one of four arrival transfer points located at various corners of the St. Louis TRACON airspace. Once at the arrival corner-posts, aircraft would then be vectored to a runway at STL or one of its reliever airports. Departing aircraft would be routed utilizing airspace between the arrival routes. As a result, the corner post system would provide for efficient separation of arriving and departing aircraft.

The MAP project team developed ten variants of the four-corner post plan. Once the routes and procedures for each of the ten alternatives were designed, two additional criteria were applied.

First, the financial feasibility of the alternatives was examined. Several alternatives would have required the relocation of Airport Surveillance Radar (ASR) equipment and the redrawing of facility airspace boundaries. Prohibitive financial costs or infrastructure challenges resulted in their elimination.

Second, each alternative was evaluated using Enhanced Target Generator (ETG) simulation. The ETG allows air traffic controllers to assign air traffic to an alternative's routes. This allowed the design team personnel to identify any limitations in the designs that were not originally envisioned.

Based on financial feasibility and ETG modeling, seven of the ten alternatives were removed from consideration as they did not meet the purpose and need. These alternatives are discussed in Appendix A.

The remaining three alternatives, as well as the Future Baseline have been carried forward for detailed analysis.

A major advantage of all the Action Alternatives is the creation of additional airspace sectors. Sectors are used to divide the airspace into smaller, more manageable, units. Each sector is then assigned to an individual air traffic controller. During periods of light volume, a controller may manage aircraft in more than one sector. However, no more than one controller may manage an individual sector at the same time. The additional departure sectors that would be created under the Action Alternatives would allow for increased flexibility and efficiency in the airspace.

2.2 ALTERNATIVES CARRIED FORWARD FOR DETAILED ANALYSIS

The following subsections present high-level descriptions of the proposed alternatives considered in this EA. General descriptions of routings for jet, turboprop and propeller aircraft are explained as well as the general airspace structure for the given alternative. Jets and turboprop/propeller aircraft are segregated into different routes because they move at different speeds and altitudes.

The Future Baseline alternative represents changes to routing that are required in order to implement the new runway at STL. These changes only integrate traffic from the new runway into the existing TRACON airspace, with no overall modifications to the regional airspace. For the alternatives, 4A, 6, and 10, only those routes that differ from the Future Baseline will be discussed in this chapter, but every route for each alternative has been fully modeled to determine the cumulative noise impact.

There are two primary flows, or route structures, at STL; east, using runways 12L, 12R, and 11 (new runway), and west, using 30L, 30R, 29 (new runway). Flow direction is determined by ATCT personnel, based on prevailing winds and air traffic demand.

Each of the alternatives is a derivation of the four-corner general airspace design approach therefore each alternative has four major arrival corridors. Departing aircraft routes were designed to utilize the airspace between the arrival corridors.

Detailed routing information of each alternative carried forward in the analysis, can be found in the accompanying composite figures. This detailed routing information is depicted in Figures 2-1 through 2-6. Each figure represents composite graphic representations of the three action alternatives and the future baseline, both jet and prop, for ease in comparison.

2.2.1 Future Baseline

The Future Baseline alternative maintains the existing airspace structure with the exception that the initial arrival runway alignments and final departure runway headings are changed due to the implementation of runway 11/29. These in close impacts were analyzed, and approved, in the Lambert-St. Louis International Airport New Runway (W-IW) EIS.

Figures 2-1 through 2-6 depict STL flows for the Future Baseline alternative in the lower right quadrant of each figure

STL East Runway Arrival Flows

Under the Future Baseline, there would be four primary East Runway arrival tracks, NE, SE, SW, and NW. These routes merge into a single final approach heading at a point over the Mississippi River, approximately 15 miles northwest of STL (Figure 2-1).

FIGURE 2-1. ALTERNATIVE ARRIVAL ROUTES – EAST FLOW

FIGURE 2-2. ALTERNATIVE JET DEPARTURE ROUTES – EAST FLOW

FIGURE 2-3. ALTERNATIVE TURBOPROP DEPARTURE ROUTES – EAST FLOW

FIGURE 2-4. ALTERNATIVE ARRIVAL ROUTES – WEST FLOW

FIGURE 2-5. ALTERNATIVE JET DEPARTURE ROUTES – WEST FLOW

FIGURE 2-6. ALTERNATIVE TURBOPROP DEPARTURE ROUTES – WEST FLOW

STL East Runway Departure Flows

The Future Baseline east runway departure flows (i.e., Runways 12L, 12R and 11) maintain the existing two-sector departure airspace boundaries similar to those presently used (Figures 2-2, and 2-3 - alternative in the lower right quadrant of each graphic).

NE Quadrant Airspace Departures

Jet departures in the northeast quadrant would use one primary departure heading to the SE. This route would split twice, into a total of three departure routes. The first split would occur over the Mississippi River, just east of St. Louis, MO. The second split would occur approximately five miles north of Alton, IL. Jets bound for cities such as Columbus, OH; Washington, DC; and Boston, MA would use these routes.

Turboprop and propeller departures in the northeast quadrant would use one primary turboprop/prop route departure heading to the east. This route would split into a total of three routes starting at a point less than 3 miles northeast of Florissant, MO. Turboprop and propeller planes bound for cities such as South Bend, IN and Springfield, IL would use these routes.

SE Quadrant Airspace Departures

Jet departures in the southeast quadrant would use one primary departure heading to the SE. This route would split into two routes at a point less than 3 miles southeast of STL. Jets bound for cities such as Cincinnati, OH; Charlotte, NC; and Atlanta, GA would use these routes.

Turboprop and propeller departures in the southeast quadrant would use one primary departure heading to the south. The route would split into three routes over the intersection of Interstates 270 and 55. Turboprop and propeller planes bound for cities such as Louisville, KY; Evansville, IN; and Cape Girardeau, MO would use these routes.

SW Quadrant Airspace Departures

Jet departures in the southwest quadrant would use two primary departure headings to the SE. This route would split into a total of four routes over the intersection of Interstates 64 and 170. Jets bound for cities such as Birmingham, AL; New Orleans, LA; and San Diego, CA would use these routes.

Turboprop and propeller departures in the southwest quadrant would use one primary departure heading to the south. This route would split into a total of five routes over the intersection of Interstates 64 and 170. Turboprop and propeller planes bound for cities such as Memphis, TN; Joplin, MO; and Columbia, MO would use these routes.

NW Quadrant Airspace Departures

Jet departures in the northwest quadrant would use three primary departure headings to the SE. These routes would continue through a point approximately 10 miles northwest of Alton, IL. Jets bound for cities such as Honolulu, HI; Los Angeles, CA; Seattle, WA; and Minneapolis-St. Paul, MN would use these routes.

Turboprop and propeller departures in the northwest quadrant would use two primary departure headings to the south and east. Over the Chesterfield, MO, these two routes would split into a total of four routes. Turboprop and propeller planes bound for cities such as Kansas City, MO; Sioux City, IA; and Burlington, IL would use these routes.

STL West Runway Arrival Flows

Under the Future Baseline, arriving aircraft would be routed to STL via one of five arrival routes in a west configuration (Figure 2-4 - alternative in the lower right quadrant of this graphic). These routes would begin to merge into a single final approach heading approximately 20 miles SE of STL, above Interstate 64, west of New Baden, IL.

<u>STL West Runway Departure Flows</u>

Similar to the SE departure flows, the west departure flows (i.e., Runways 29, 30L and 30R) would maintain the existing two sector departure airspace boundaries similar to those presently used (Figure 2-5 and 2-6 - alternative in the lower right quadrant of each graphic).

NE Quadrant Airspace Departures

Jet departures in the northeast quadrant would use one primary departure heading to the NW. The initial route would split into four routes at a point approximately three miles NW of Florissant, MO. Jets bound for cities such as Chicago, IL; New York, NY; and Washington, DC would use these routes.

Turboprop and propeller departures in the northwest quadrant would use one primary heading to the NW. Over the Mississippi River, approximately ten miles west of Alton, IL, this route would split into three routes. Turboprop and propeller planes bound for cities such as South Bend, IN and Champaign, IL would use these routes.

SE Quadrant Airspace Departures

Jet departures in the southeast quadrant would use two primary headings to the WNW. This route would continue through a point three miles NE of the intersection of Interstates 255 and 55. Jets bound for cities such as the Washington DC area; Cincinnati, OH; Charlotte, NC; and Atlanta, GA would use these routes.

Turboprop and propeller departures in the southeast quadrant would use one primary heading to the west. This route would split into three routes over Interstate 55, less than five miles west of Oakville, MO. Turboprop and propeller planes bound for cities such Louisville, KY; Evansville, IN; and Cape Girardeau, MO would use these routes.

SW Quadrant Airspace Departures

Jet departures in the southwest quadrant would use one primary heading to the NW. Five miles south of St Peters, MO, the route would split into four routes. Jets bound for cities such as Ft. Lauderdale, FL; Birmingham, AL; and New Orleans, LA would use these routes.

Turboprop and propeller departures from the southwest quadrant would use one primary heading to the WSW. At a point over the Missouri River, approximately five miles west of Chesterfield, MO, this route would split into a total of five routes. Turboprop and propeller planes bound for cities such as Memphis, TN; Ft. Joplin, MO; and Columbia, MO would use these routes.

NW Quadrant Airspace Departures

Jet departures in the northwest quadrant would use one primary heading to the NW. At a point over the Illinois bank of the Mississippi River, north of St Charles, MO, the route would split in two. Jets bound for cities such as Minneapolis-St. Paul, MN; Los Angeles, CA; and Honolulu, HI would use these routes.

Turboprop and propeller departures from the northwest quadrant would use two primary departure headings to the NW. Approximately five miles southwest of southwest of St. Peters, MO, the route would split into four routes. Turboprop and propeller planes bound for cities such as Omaha, NE, and Kansas City, MO would use these routes.

<u>Future Baseline Alternative – Satellite Airport(s) Departure Flows</u>

Satellite airports are airports in the study area other than the primary airport, Lambert St. Louis International. Redesigning the arrival and departure routes from STL required modifications to routes at other airports in the study area. Changes in route structure as a result of airspace redesign initiatives occurred relative to the following four airports. As a result of proposed air traffic route changes to and from these satellite airports, operations relative to these airports were modeled as part of the noise analysis.

- Spirit of St. Louis Airport (SUS)
- St. Louis Downtown Airport - Cahokia Airport (CPS)
- St. Louis Regional Airport (ALN)
- Scott Air Force Base, Mid-America Airport (BLV)

Under the Future Baseline alternative, the major changes to satellite airport jet and high performance turboprop departure flows are altitude caps (e.g., these aircraft do not climb above 5,000 ft until a certain point). Providing these altitude requirements are met, planes on these routes would be able to ascend on course to their approved flight plan altitudes.

Future Baseline - SUS East Flow

Arrivals

SUS arrivals enter the study area from multiple directions and proceed on generally straight flight paths towards SUS. Closer to the airport, the aircraft are directed onto an arrival heading that extends west to a point approximately five miles northeast of Washington, MO.

Departures

Four major departure tracks, southeast, southwest, northwest, and northeast, develop immediately upon take-off. These tracks then become widely dispersed and remain constant to the study area boundary.

Future Baseline - SUS West Flow

Arrivals

Arrival routes to SUS converge along a final approach heading that extends west from BLV towards SUS to a point close to the intersection of Interstates 270 and 64.

Departures

SUS departures are scattered across a broad range of headings upon takeoff. Once on a specified heading, the aircraft generally maintain this heading until they exit the study area.

Future Baseline - CPS East Flow

Arrivals

CPS arrivals enter the study area from multiple directions and proceed on generally straight flight paths towards CPS. CPS arrivals from the northwest are directed to the north, over Alton, or to the south, over Chesterfield, in order to reduce conflicts with the much larger STL flow. Aircraft arriving from the east are routed into one of these flows or to a point southeast of Belleville, IL where they are then placed onto an arrival heading.

Departures

CPS departures are scattered across a broad ranges of heading upon takeoff. Departures to the northwest are directed to the north, over Alton, or to the south, over Chesterfield, MO, in order to reduce conflicts with the much larger STL flow. Once on a specified heading, the aircraft generally maintain this heading until they exit the study area.

Future Baseline - CPS West Flow

Arrivals

CPS arrivals enter the study area from multiple directions and proceed on generally straight flight paths towards CPS. CPS arrivals from the northwest are directed to the north, over Alton, or to the south, over Chesterfield, in order to reduce conflicts with the much larger STL flow. Closer to the airport, the aircraft are directed into an arrival heading that extends southeast from CPS approximately ten miles to a point southeast of Bellville, IL.

Departures

CPS departures are scattered across a broad ranges of heading upon takeoff. Departures to the northwest are directed to the north, over Alton, IL, or to the south, over Chesterfield, MO in order to reduce conflicts with the much larger

STL flow. Once on a specified heading, the aircraft generally maintain this heading until they exit the study area.

Future Baseline - ALN East Flow

Arrivals

ALN arrivals entering the study area generally proceed directly to St. Louis Regional Airport. The aircraft approach the airport from the northwest and begin to change heading for landing less than three miles north of Alton. IL.

Departures

Aircraft departing ALN diverge into three major flows to the west, north, and east, within five miles of the runway. Within ten miles of ALN, aircraft have transitioned to a wide range of tracks that generally remain constant to the boundary of the study area.

Future Baseline - ALN West Flow

Arrivals

Aircraft utilizing the primary runway are routed onto a final arrival heading that extends from ALN approximately ten miles to the southeast to a point five miles east of Edwardsville, IL. Headings for aircraft utilizing the crosswind runway converge directly south of ALN.

Departures

Departure routes to the northwest quickly diverge into four major flows less than two miles from ALN. These major flows, NW, NE, SE, and SW are then further divided into a wide range of tracks.

Future Baseline - BLV East Flow

Arrivals

Arrival routes to BLV converge along a final approach heading that extends northwest from BLV to a point approximately 1 mile southeast of Collinsville, IL.

Departures

Four major departure tracks, east, southeast, northwest, and west, develop immediately upon take-off. These tracks then diverge into a wide range of tracks.

Future Baseline - BLV West Flow

Arrivals

Arrival routes to BLV converge along a final approach heading that extends approximately 10 miles to the southeast to a point over the Kaskaskta River.

Departures

Three major departure tracks, east, southwest, and northwest develop immediately upon take-off. These tracks then diverge into a wide range of tracks.

2.2.2 Alternative 4A

Alternative 4A repositions arrivals to a true four-corner post operation on tracks that are at approximately 45° in relation to the alignment of primary STL runways. The NW quadrant heading would be shifted to the north and the SW quadrant heading would be shifted to the south.

STL departure flows would also be repositioned to a four-sector configuration. This new sector boundary configuration allows for greater flexibility in handling peak hour arrival and departure ATC service demand levels.

Figures 2-1 through 2-6 depict STL flows for Alternative 4A in the lower left quadrant of the each graphic.

STL East Runway Arrival Flows

The NW and SW Alternative 4A arrival routes would be shifted to the north and south, respectively. This would create greater spacing between the arrival tracks and would allow for departing jets to be routed in between the two arrival tracks. The NE and SE arrival routes would not be changed relative to the Future Baseline.

STL East Runway Departure Flows

NE Quadrant Airspace Departures

Under Alternative 4A the northern-most jet departure route in the NE quadrant begins at a point approximately 8 nautical miles SE of Alton, IL. The heading would continue to the NW to a navigational fix in the vicinity of Greenfield, IL. To the north of this point, the alternative heading would mirror the Future Baseline heading.

Turboprop/propeller departure routes would also be modified under Alternative 4A. These three routes would diverge at a point 5 NM west of Alton, IL rather than at a point 5 NM north of Alton. The Alternative 4A routes would then correspond to the tracks under the Future Baseline.

SE Quadrant Airspace Departures

The northern-most route in this quadrant, which begins at a point approximately 15nm SE of STL, and proceeds ENE, is an additional route not present in the Future Baseline.

Turboprop and propeller departures from the southeast quadrant would be identical under the Future Baseline and Alternative 4A.

SW Quadrant Airspace Departures

No substantial changes would be made to the departure routes from what is shown in the Future Baseline alternative.

NW Quadrant Airspace Departures

An additional departure route would be added under Alternative 4A. This heading would proceed to the northwest, generally following the eastern bank of the Mississippi River. This heading would replace the northern-most heading present in the Future Baseline.

A similar route would also be added for turboprop/propeller aircraft.

STL West Runway Arrival Flows

The routes in the NW and SW quadrants would be shifted to the north and south, respectively, which would allow for aircraft departing STL to be routed between the arrival tracks.

STL West Runway Departure Flows

NE Quadrant Airspace Departures

The northern-most departure route would be shifted to the west under Alternative 4A and would generally track the Mississippi River to the northwest.

The NNW turboprop/propeller departure route would be eliminated.

SE Quadrant Airspace Departures

An additional route would be added that would extend from the point over Sunset Hills, MO to the ENE over Interstate 57 to the north of Salem, IL.

No substantial changes would be made to the turboprop/propeller routes.

SW Quadrant Airspace Departures

The final jet departure headings would not change under Alternative 4A. The point at which aircraft are turned off their initial departure heading to join these routes would be shifted to the northwest over the Missouri River, west of St. Charles, MO.

No substantial changes would be made to the turboprop/propeller routes.

NW Quadrant Airspace Departures

An additional jet departure route would be added in the northwest quadrant. This route would originate from a point over the Illinois bank of the Mississippi River, approximately 8 miles north of St. Charles, MO and track the Mississippi River to northwest.

The primary heading for turboprop/propeller departures would shift to the NW. This route would split into three turboprop/propeller routes extending to the northwest.

Alternative 4A – Satellite Airport(s) Traffic Flows

Alternative 4A - SUS East Flow

Arrivals

There are no substantial differences in east flow SUS arrival routes between the Future Baseline and Alternative 4A.

Departures

There are no substantial differences in east flow SUS departure routes between the Future Baseline and Alternative 4A

Alternative 4A - SUS West Flow

Arrivals

There are no substantial differences in west flow SUS arrival routes between the Future Baseline and Alternative 4A.

Departures

There are no substantial differences in west flow SUS departures routes between the Future Baseline and Alternative 4A.

Alternative 4A - CPS East Flow

Arrivals

Several of the northwest quadrant arrival routes are further to the east in Alternative 4A than in the Future Baseline. Under Alternative 4A aircraft on these routes would travel southeast to a point approximately 5 miles east of Edwardsville, IL. From this point, the aircraft would proceed southwest to CPS.

Departures

Under Alternative 4A two CPS departure routes in the northwest quadrant would be shifted east to a heading that departs the study area approximately five miles west of Springfield, IL.

Alternative 4A - CPS West Flow

Arrivals

Several northwest quadrant arrival routes would be routed further to the east, to a point approximately 8 miles east of Alton, IL before turning south/southwest towards CPS.

Departures

One northwest quadrant route would be directed to the south upon take-off and would then turn north/northwest on a route that heading that would proceed approximately ten miles east of Bowling Green, MO.

Alternative 4A - ALN East Flow

Arrivals

A route in the northwest quadrant would be shifted to the west to a course that proceeds to the south/southwest approximately 20 miles east of Bowling Green, MO.

Departures

There are no substantial differences in east flow ALN departure routes between the Future Baseline and Alternative 4A.

Alternative 4A - ALN West Flow

Arrivals

A northwest quadrant high performance aircraft arrival route would be eliminated under Alternative 4A.

Departures

There are no substantial differences in west flow ALN departure routes between the Future Baseline and Alternative 4A.

Alternative 4A - BLV East Flow

Arrivals

There are no substantial differences in east flow BLV arrival routes between the Future Baseline and Alternative 4A.

Departures

There are no substantial differences in east flow BLV departure routes between the Future Baseline and Alternative 4A.

Alternative 4A - BLV West Flow

Arrivals

There are no substantial differences in west flow BLV arrival routes between the Future Baseline and Alternative 4A.

Departures

One route in the northeast quadrant would be shifted to the northern shore of Caryle Lake in Illinois.

2.2.3 Alternative 6

Alternative 6 also moves arrivals to a four-corner post operation that is more like the Future Baseline in relation to the alignment of primary STL runways. No new departure procedures are developed for this alternative. Airspace is also divided into 4 departure sectors to allow for greater flexibility in managing arrival and departure flows based upon peak hour ATC service demand levels. The major difference between Alternative 6 and the Future Baseline is that jet arrivals and jet departures are segregated in such a manner that departures climb to 10,000 feet without the repeated need to change heading to avoid arrivals.

Figures 2-1 through 2-6 depict STL flows for the Alternative 6 in the upper right quadrant of each graphic.

STL East Runway Arrival Flows

An additional arrival heading would be added in both the NW and SW quadrants. These routes are further to the west of STL than the existing routes and would allow aircraft a more direct routing to the final approach heading.

STL East Runway Departure Flows

The east runway departure flows (e.g., Runways 12L, 12R and 11) of Alternative 6 move to a four (4) sector departure airspace boundary configuration. This new sector boundary configuration allows for greater flexibility in handling peak hour arrival and departure ATC service demand levels.

NE Quadrant Airspace Departures

The transition point for the jet departure routes would be shifted north to a point approximately five miles southeast of Alton, IL.

The transition point for the turboprop/propeller routes would be shifted to the south to a point 5 miles west of Alton, IL. Final tracks for these routes would be the same under Alternative 6 and the Future Baseline.

SE Quadrant Airspace Departures

No substantial changes would be made to the jet or turboprop/propeller departure headings.

SW Quadrant Airspace Departures

The transition points for the four final routes would be simplified under Alternative 6. The three routes would diverge from a point over Interstate 44 in the Webster Groves area.

Alternative 6 turboprop/propeller routes would generally remain the same, with the transition point of the two southern-most routes shifting to the south to a point approximately 10 miles south of Chesterfield, MO.

NW Quadrant Airspace Departures

Turboprop/propeller departures to the NW quadrant will generally be assigned an easterly initial depart heading instead of the southerly heading assigned in the Future Baseline alternative.

<u>STL West Runway Arrival Flows</u>

An additional arrival route would be added in both the NE and SE quadrants. These routes are further to the east of STL than the existing routes and would allow aircraft a more direct routing to the final approach heading.

<u>STL West Runway Departure Flows</u>

The Alternative 6 west runway departure flows also moves to a four sector departure airspace boundary configuration. This new sector boundary configuration allows for greater flexibility in handling peak hour arrival and departure ATC service demand levels.

NE Quadrant Airspace Departures

The transition point for the three northeast jet departure routes would be shifted to the north to a point south of the Mississippi River, approximately 10 miles west of Alton, IL.

No substantial changes would be made to the turboprop/propeller departure headings.

SE Quadrant Airspace Departures

The transition point for the two southern-most jet departure routes would be shifted to the south to a point along Interstate 55 less than two miles south of Arnold, MO.

No substantial changes would be made to the turboprop/propeller departure headings.

SW Quadrant Airspace Departures

Under Alternative 6, all four of the southwest quadrant departure routes would diverge at a point approximately 5 miles west of St. Peters, MO.

No substantial changes would be made to the turboprop/propeller departure headings.

NW Quadrant Airspace Departures

Turboprop/propeller departures filed for the Ozark DP would generally be assigned an initial departure heading to the NW instead of the westerly heading assigned in the Future Baseline.

The point at which the two turboprop/propeller departure routes to the northwest diverge would be relocated to a point north of the Mississippi River, less than 5 miles southwest of Jersey, IL.

<u>Alternative 6 – Satellite Airport(s) Traffic Flows</u>

Alternative 6 - SUS East Flow

Arrivals

SUS arrivals would normally no longer be vectored over STL but would be routed around STL as they are in the Future Baseline. Several of the northeast quadrant routes are now directed south of Kirkwood, MO to SUS.

Departures

There are no substantial differences in east flow SUS departure routes between the Future Baseline and Alternative 6.

Alternative 6 - SUS West Flow

Arrivals

There are no substantial differences in west flow SUS arrival routes between the Future Baseline and Alternative 6.

Departures

There are no substantial differences in west flow SUS departure routes between the Future Baseline and Alternative 6.

Alternative 6 - CPS East Flow

Arrivals

There are no substantial differences in east flow CPS arrival routes between the Future Baseline and Alternative 6.

Departures

There are no substantial differences in east flow CPS departure routes between the Future Baseline and Alternative 6.

Alternative 6 - CPS West Flow

Arrivals

There are no substantial differences in west flow CPS arrival routes between the Future Baseline and Alternative 6.

Departures

There are no substantial differences in west flow CPS departure routes between the Future Baseline and Alternative 6.

Alternative 6 - ALN East Flow

Arrivals

One southwest quadrant arrival route would be shifted to a more northerly course, which would cross the Missouri River at a point approximately 10 miles northwest of Washington, MO.

Departures

One southwest quadrant departure route would be shifted to the south under Alternative 6. Aircraft on this route would be directed to the south around St. Louis to a point three miles northwest of Waterloo, IL. From this point the route would turn west and continue to the study area boundary.

Alternative 6 - ALN West Flow

Arrivals

One southwest quadrant route would be shifted to the south under Alternative 6. Aircraft on this route would head east/southeast to a point 15 miles east of Sullivan, MO. From this point, the route turns to the north towards ALN.

Departures

Under Alternative 6, departure routes in the southwest quadrant would be combined into one major route. Aircraft on these routes would fly west/northwest to Winfield, MO, where they would turn to the southwest. The aircraft would maintain the southwest heading until they depart the study area.

Alternative 6 - BLV East Flow

Arrivals

There are no substantial differences in east flow BLV arrival routes between the Future Baseline and Alternative 6.

Departures

There are no substantial differences in east flow BLV departure routes between the Future Baseline and Alternative 6.

Alternative 6 - BLV West Flow

Arrivals

There are no substantial differences in west flow BLV arrival routes between the Future Baseline and Alternative 6.

Departures

There are no substantial differences in west flow BLV departure routes between the Future Baseline and Alternative 6.

2.2.4 Alternative 10

This alternative also moves arrivals to a four-corner post operation that is more like the Future Baseline in relation to the alignment of primary STL runways. Two new departure procedures are developed for this alternative and two existing departure procedures are abandoned. Under Alternative 10, the airspace would be divided into 3 departure sectors.

Similar to Alternative 6, in Alternative 10 departures climb to a higher altitude prior to tunneling beneath the arrival tracks. In this alternative arrivals are descended to 9,000 ft. MSL on the arrival tracks and departures are climbed unrestricted to 8,000 ft. MSL prior to tunneling. This retains some of the advantages of Alternative 6. However, the necessity to level and/or turn to get clear of the arrival tracks will occur more often than in Alternative 6, but less than in either the Future Baseline or Alternative 4A.

Figures 2-1 through 2-6 depict STL flows for the Alternative 10 in the upper left quadrant of each graphic.

STL East Runway Arrival Flows

Under Alternative 10, the NW quadrant arrival heading would be shifted to the north and the route for turboprop/propeller aircraft arriving from the north would be moved west from its current position along I-55.

STL East Runway Departure Flows

NE Quadrant Airspace Departures

There are no differences between the east flow, northeast quadrant jet departure routes of Future Baseline and Alternative 10.

The final tracks of the turboprop/propeller departure routes do not change under Alternative 10 when compared to the Future Baseline. However, differences do exist in how the routes diverge from the primary departure heading. Under Alternative 10, the five routes would diverge from one primary heading over the Mississippi River, approximately 5 miles west of Alton, IL.

SE Quadrant Airspace Departures

Under Alternative 10, an additional departure route would be created. The new route would diverge from the primary route along Route 50, approximately five miles southeast of Highland, IL.

The only difference between Alternative 10 and the Future Baseline turboprop/propeller routes is where the first split occurs on the primary route. Under Alternative 10, this spilt would occur over the Mississippi River, approximately 5 miles southeast of Oakville, MO.

SW Quadrant Airspace Departures

The southwest quadrant jet departure routes would be simplified under Alternative 10. Routes that require multiple heading changes would be replaced by four routes that diverge from a primary heading over the City of St. Louis, along Interstate 64.

The two southern-most SW quadrant departure routes diverge approximately 10 miles further to the southwest under Alternative 10 than under the Future Baseline.

NW Quadrant Airspace Departures

Under Alternative 10, the northwest quadrant jet departure routes would be simplified by creating routes with a constant track from a point along the Mississippi River, just southwest of Alton, IL.

The northwest quadrant turboprop/propeller routes would be modified under Alternative 10. A new route would diverge from the primary route along Interstate 70, midway between O'Fallon, MO and Wentzville, MO.

STL West Runway Arrival Flows

The route in NW quadrant would be shifted to the north, which would allow for aircraft departing STL to be routed between the arrival tracks.

STL West Runway Departure Flows

NE Quadrant Airspace Departures

The two northern-most routes in the northeast quadrant would be adjusted to the east. Jets on these routes would travel to the east of Jacksonville, IL and exit the TRACON airspace to the NNE.

Turboprop/propeller aircraft filed on the 2 northeast departure procedures will be assigned an initial heading west rather than the northerly heading assigned in the Future Baseline alternative. Instead of a three-way split 10 miles WNW of Alton, the new routes would be staggered with one route splitting off 10 miles WNW of Alton, IL and the other route occurring approximately 5 miles NNW of Alton, IL.

SE Quadrant Airspace Departures

Jets filed for one of the southeast departure procedures would normally be assigned a more northerly heading than the NW heading assigned in the Future Baseline alternative and will track north of STL prior to turning towards their departure route. However, the NW heading may also be used as necessary. If it is necessary to use the NW heading, aircraft will track south of STL as before.

Under Alternative 10, all four of the alternative routes would diverge from a point less than 5 miles west of Alton and continue on constant tracks to the perimeter of the TRACON airspace.

SW Quadrant Airspace Departures

Jet departures would normally be assigned an initial departure heading slightly left of the 305º heading assigned in the Future Baseline alternative. The primary southwest quadrant jet departure heading would turn to the SW at a point 3 miles south of St. Charles, MO. Two routes would diverge from this primary route approximately 8 miles south of St. Charles and the remaining two routes would diverge at a point over Chesterfield, MO.

Under Alternative 10, the four southern-most turboprop/propeller routes would diverge at a point less than three miles east of Chesterfield, MO.

NW Quadrant Airspace Departures

An additional northwest quadrant jet departure route would be added under Alternative 10. This route would proceed NNW from a point 5 miles northwest of St. Charles, MO. The northern-most jet departure route would be moved to the east of Jacksonville, IL and depart the TRACON airspace to the NNE.

All five of the turboprop/propeller routes would originate from a point over the Illinois bank of the Mississippi River, approximately 8 miles north of St. Charles, MO. An additional route would be added that continues to the NW.

Alternative 10 – Satellite Airport(s) Traffic Flows

Alternative 10 - SUS East Flow

Arrivals

There are no substantial differences in east flow SUS arrival routes between the Future Baseline and Alternative 10.

Departures

There are no substantial differences in east flow SUS departure routes between the Future Baseline and Alternative 10.

Alternative 10 - SUS West Flow

Arrivals

There are no substantial differences in west flow SUS arrival routes between the Future Baseline and Alternative 10

Departures

There are no substantial differences in east flow SUS departure routes between the Future Baseline and Alternative 10

Alternative 10 - CPS East Flow

Arrivals

Several arrival routes in the northwest quadrant would be modified from the Future Baseline condition, under Alternative 10. Three arrival routes would merge into one route at a point approximately 5 miles southeast of Pittsfield, IL. Aircraft on this combined route would then proceed southwest to a point 8 miles northeast of Alton where they would then turn southwest towards CPS.

Departures

There are no substantial differences in east flow CPS departure routes between the Future Baseline and Alternative 10.

Alternative 10 - CPS West Flow

Arrivals

Several arrival routes in the northwest quadrant would be modified from the Future Baseline condition, under Alternative 10. Three arrival routes would merge into one route at a point approximately 10 miles southwest of Jacksonville, IL. Aircraft on this combined route would then proceed southwest to a point 10 miles east of Alton, IL where they would then turn southwest to CPS.

Departures

One northwest quadrant route would track to the south after the aircraft takes-off and would then turn north/northwest on a route that would cross the Mississippi River approximately ten miles east of Bowling Green, MO.

Alternative 10 - ALN East Flow

Arrivals

There are no substantial differences in east flow ALN arrival routes between the Future Baseline and Alternative 10.

Departures

There are no substantial differences in east flow ALN departure routes between the Future Baseline and Alternative 10.

Alternative 10 - ALN West Flow

Arrivals

There are no substantial differences in west flow ALN arrival routes between the Future Baseline and Alternative 10.

Departures

There are no substantial differences in west flow ALN departure routes between the Future Baseline and Alternative 10.

Alternative 10- BLV East Flow

Arrivals

The two routes in the northwest quadrant would be shifted north beginning at a point approximately 15 miles east of Bowling Green, MO.

Departures

An additional northwest quadrant route would be added under Alternative 10. This route would extend northwest from a point five miles east of Alton, IL and cross the Missouri River approximately ten miles northeast of Bowling Green, MO.

Alternative 10 - BLV West Flow

Arrivals

The two routes in the northwest quadrant would be shifted north beginning at a point approximately 15 miles east of Bowling Green, MO.

Departures

Under Alternative 10, one route in the northwest quadrant would be shifted to the north of Hannibal, MO. A route in the northeast quadrant would be shifted to the northern shore of Caryle Lake IL.

A qualitative comparison of the three Action Alternatives, labeled as 4A, 6, and 10, and the Future Baseline is presented in Table 2-2. This comparison allows decision makers to examine not only operational metrics, but also environmental impacts, in order to make a more informed decision.

TABLE 2-2. AIRSPACE REDESIGN TEAM EVALUATION OF ALTERNATIVES

Purpose and Need Alternatives Evaluation Categories/Goals	Future Baseline	Alternative 4A	Alternative 6	Alternative 10
Operational Viability (OV) Goals*				
OV Goal 1: Reduce Complexity	○	◉	◉	●
OV Goal 2: Reduce Voice Communications	◉	◉	◉	●
OV Goal 3: Foster Ease of Implementation	●	◉	◉	◉
Operational Efficiency (OEF) Goals*				
OEF Goal 1: Reduce Delay	○	◉	◉	●
OEF Goal 2: Balance Controller Workload	○	●	●	●
OEF Goal 3: Meet System Demands	◉	◉	◉	●
OEF Goal 4: Improve User Access to the System	○	◉	◉	◉
OEF Goal 5: Expedite Arrivals and Departures	○	●	●	●
OEF Goal 6: Increase Flexibility in Routing	○	◉	●	●
OEF Goal 7: Maintain Airport Throughput	○	●	●	●
Significant Environmental Impacts	None	None	None	None

* Source: Operational Evolution Plan, (OEP); Airspace Management Handbook – Metrics;

● Alternative has a **High** Probability of meeting OV/OEP Goal
◉ Alternative has an **Average** Probability of meeting OV/OEP Goal
○ Alternative has a **Low** Probability of meeting OV/OEP Goal

CHAPTER III – AFFECTED ENVIRONMENT

The purpose of this chapter is to describe the character of the existing environment in which the proposed project would occur. Because neither the Future Baseline nor any of the Proposed Project Alternatives involve land disturbances, the potential for environmental consequences is limited. Therefore, the discussion of the affected environment is limited a description of only those environmental resources which have the potential to be affected.

3.1 STUDY AREA SETTING AND LOCATION

The airspace redesign study encompasses the area within a 75 NM radius centered on Lambert St. Louis International Airport, located approximately 13 miles northwest of downtown St. Louis, Missouri. Vertically, the study area extends from ground level to 18,000 feet above mean sea level (MSL). The area in which the proposed airspace redesign changes would occur determined the size of the study area.

The study area is comprised of portions of two states, Missouri and Illinois. Fifty-eight counties and one independent city, St. Louis, are located within the study area. An independent city is a city that does not belong to any county and interacts directly with the state government. Figure 3-1 depicts the study area while Table 3.1 lists the counties and the independent city within the study area.

TABLE 3-1. COUNTIES AND INDEPENDENT CITY LOCATED WITHIN THE STUDY AREA

Missouri	
Audrain	Montgomery
Bollinger	Osage
Callaway	Perry
Cape Girardeau	Phelps
Crawford	Pike
Dent	Ralls
Franklin	Reynolds
Gasconade	St. Charles
Iron	St. Francois
Jefferson	St. Louis
Lincoln	St. Louis City
Madison	Ste. Genevieve
Maries	Warren
Marion	Washington
Monroe	

Illinois	
Adams	Madison
Bond	Marion
Brown	Menard
Calhoun	Monroe
Cass	Montgomery
Christian	Morgan
Clinton	Perry
Effingham	Pike
Fayette	Randolph
Franklin	Sangamon
Greene	Schuyler
Jackson	Scott
Jefferson	Shelby
Jersey	St. Clair
Macoupin	Washington

FIGURE 3-1. STUDY AREA

3.2 EXISTING LAND USE

Figure 3-2 presents land use classifications created by the Missouri Resources Assessment Partnership (MoRAP) and the Illinois Department of Natural Resources. Urban land uses associated with metropolitan St. Louis area dominate the center of the study area. Substantial areas of urban land uses are also found in the northeast quadrant of the study area associated with Springfield, IL.

Apart from the major cities, the forest and cropland land uses dominate the study area. Generally, those areas that can support agriculture have been converted to either row crops or pastureland. Areas lacking the requisite soil or topographic characteristics have been retained as woodlands. These forested areas are most common in the southwest quadrant of the study area, where hilly terrain limits agriculture. Wetlands, swamps, and marshes can be found in association with the major rivers in the area as well as several larger lakes.

3.3 POPULATION AND DEMOGRAPHICS

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*, requires that Federal agencies determine the impact of their actions on minority and low-income populations and to ensure that these actions do not disproportionately impact these populations. This section describes the demographic characteristics of the study area population necessary to make such an assessment.

The study area encompasses the St. Louis metropolitan area and outlying counties. For larger cities, such as St. Louis, the U.S Census Bureau recognizes that a substantial percentage of the population associated with a city may not reside within the city limits. Therefore, Metropolitan Statistical Areas (MSAs) were developed. MSAs include all towns, cities, and counties that are metropolitan in character and are economically and socially integrated with the central counties. For statistical purposes, the U.S. Census Bureau has defined the boundaries of the St. Louis Metropolitan Statistical Area (MSA) as including the following counties (Figure 3-3).

- Missouri – Franklin, Jefferson, Lincoln, St. Charles, St. Louis City, St. Louis County and Warren
- Illinois – Clinton, Jersey, Madison, Monroe, St. Clair

Relevant demographic data for the St. Louis MSA, the study area, Illinois, Missouri, and the United States are provided in Tables 3-2 and 3-3 and in Figures 3-4 and 3-5.

TABLE 3-2. 1990 AND 2001 POPULATION DATA

Area	1990	2001	% Change
Illinois			
State-wide	11,430,602	12,482,301	9.2%
Counties in Study Area	1,405,264	1,438,151	2.3%
Missouri			
State-wide	5,117,073	5,629,707	10.0%
Counties in Study Area	2,355,616	2,506,058	6.4%
St. Louis MSA	2,492,525	2,615,422	2.8%
Study Area	3,760,880	3,944,209	4.9%
United States	248,709,873	284,796,887	14.5%

FIGURE 3-2. LAND USE

TABLE 3-3. DEMOGRAPHIC DATA

Area	% Minority Population	% Population Below Poverty Line
Illinois		
State-wide	26.5%	10.7%
Counties in Study Area	12.2%	11.4%
Missouri		
State-wide	15.1%	11.7%
Counties in Study Area	19.2%	15%
St. Louis MSA	25.9%	14.5%
Study Area	15.8%	13.7%
United States	24.9%	12.4%

Approximately 64% of the study area population lives in Missouri compared to 36% in Illinois. Although the population of the study area increased from 1990 to 2001, it did so at a slower rate than in both Missouri and Illinois. Additionally, the population in the Illinois sections of the study area grew at a slower rate than those areas in Missouri.

The U.S. Census Bureau determines poverty based on a sliding scale that incorporates the number of persons in a household and the number of children in a household. The poverty threshold varies from $8,628 for a single person over the age of 65 to $40,036 for a household with eight adults and one child. The thresholds are updated on an annual basis and are intended to be used as a statistical tool rather than an accurate description of the amount of money a family needs to live.

The poverty rates in the study area are greater than the overall poverty rates for Missouri and Illinois as well as the national poverty rate (Figure 3-4). Poverty levels are highest in those Missouri counties not included in the St. Louis MSA.

The minority population of the study area is concentrated within the St. Louis MSA and to a lesser extent, in the remaining Missouri counties (Figure 3-5). Overall, the percent minority population in the study area is less than that of Illinois as a whole and slightly higher than that of Missouri.

3.4 WEATHER AND CLIMATE

This section describes the weather patterns for the study area in terms of precipitation levels, temperatures, and wind speeds. Also discussed are the local storm trends and potential storm impacts.

The study area is located between 38-39 degrees north latitude, near the north/south midpoint of the United States. The area is alternately affected by warm moist air from the Gulf of Mexico and by drier, cold air from the north. The influence of these air masses creates a variable climate with warm, humid summers and cold conditions in the winter. On average, St. Louis experiences 35-40 days with temperatures above 90 degrees Fahrenheit. Snowfall during the winter averages 18 inches with temperatures falling below freezing less than 25 days per year.

The study area receives an average of 34 inches of precipitation per year. The spring months (March – May) tend to be the wettest (10 inches of precipitation) and the winter months (December – February) are the driest (6 inches of precipitation).

Thunderstorms are common in the summer months and occasionally can produce severe winds and large hail. Illinois and Missouri each experience an average of 26 tornadoes and sustain four casualties from cyclonic winds per year.

Windspeeds average 10-11.5 miles per hour from the northwest between December and April and average 7-10 mph from the south during the rest of the year. .

FIGURE 3-3. ST. LOUIS MSA

FIGURE 3-4. MEDIAN INCOME BY BLOCK GROUP

FIGURE 3-5. MINORITY POPULATION BY BLOCK GROUP

3.5 STUDY AREA AIRPORTS

There are 42 public-use airports located in the study area. The study area airports are listed in Table 3.4 and depicted in Figure 3-6.

Most airports in the study area are intended to serve general aviation (GA) aircraft, including small piston powered aircraft and corporate jets. GA airports support commercial charter and flight training operations, and also support fire, police, and emergency medical services flight operations. GA airports often serve as reliever airports to larger airports such as STL, in that they provide an alternate location for GA operations and thereby help to reduce congestion at larger airports.

Five airports have the potential to be affected by the proposed MAP project. They are STL, SUS, CPS, ALN, and BLV (see Section 1.1). A representative traffic sample from these airports was used to build a baseline of the existing air traffic operations and over flights for noise analysis purposes. This sample included IFR traffic into and out of STL, SUS, CPS, ALN, and BLV because only IFR aircraft would be affected by MAP. The five public-use airports are depicted in bold on Figure 3-6.

The west and east flows at Lambert-St. Louis International Airport are utilized for over 95% of the operations at STL and were, therefore, the two chosen for modeling in this EA (add actual num. Figures 3-7 and 3-8 show sample radar data for February 2003 for these the two flows. The west flow means aircraft are primarily departing to the west (and primarily arriving from the east). East flow is opposite that of west flow.

FIGURE 3-6. STUDY AREA AIRPORTS

TABLE 3-4. AIRPORTS WITHIN THE STUDY AREA

Location	Study Area Airports	ID	Distance & True Course (nm/°) from STL	Air Traffic Control Tower	Instrument Approach Service
Saint Louis, MO	Lambert-Saint Louis International Airport	STL	0 - NA	STL	YES
St. Louis, MO	Creve Coeur Airport	1H0	7.1 - 261°	NA	YES
St. Charles, MO	St. Charles Airport	3SQ	8.9 - 313°	NA	YES
St. Charles, MO	St. Charles County, Smart Airport	SET	11.4 - 344°	NA	YES
Cahokia/St. Louis, IL	St. Louis Downtown Airport	CPS	14.3 - 138°	CPS	YES
St. Louis, MO	Spirit of St. Louis Airport	SUS	14.6 - 250°	SUS	YES
Alton/St. Louis, IL	St. Louis Regional Airport	ALN	17.0 - 060°	ALN	YES
Columbia, IL	Sackman Field	H49	18.8 - 162°	NA	NA
St. Jacob, IL	St. Louis Metro-East/Shafer Field	3K6	25.9 - 092°	NA	YES
Belleville, IL	Scott AFB/MidAmerica	BLV	27.5 - 117°	BLV	YES
Moscow Mills, MO	Greensfield Airport	M71	29.7 - 289°	NA	NA
Washington, MO	Washington Memorial Airport	M06	31.3 – 253°	NA	NA
Festus, MO	Festus Memorial Airport	FES	33.2 - 183°	NA	YES
Highland, IL	Highland-Winet Airport	H07	33.9 - 087°	NA	NA
St. Clair, MO	St. Clair Regional Airport	K39	36.3 - 233°	NA	NA
Litchfield, IL	Litchfield Municipal Airport	3LF	40.6 - 052°	NA	YES
Palmyra, IL	Zelmer Memorial Airpark Inc.	5K1	43.9 - 023°	NA	NA
Greenville, IL	Greenville Airport	GRE	46.3 - 084°	NA	YES
Sparta, IL	Sparta Community-Hunter Field	SAR	47.5 - 139°	NA	YES
Hillsboro, IL	Hillsboro Municipal Airport	3K4	48.4 - 061°	NA	NA
Sullivan, MO	Sullivan Regional Airport	UUV	48.8 - 232°	NA	YES
Montgomery City, MO	Montgomery-Wehrman Airport	4MO	52.0 - 289°	NA	NA
Potosi, MO	Washington County Airport	8WC	52.2 - 200°	NA	NA
Hermann, MO	Hermann Municipal Airport	63M	53.0 - 268°	NA	NA
Bowling Green, MO	Bowling Green Municipal Airport	H19	54.8 - 314°	NA	YES
Pittsfield, IL	Pittsfield Penstone Municipal Airport	PPQ	57.0 - 341°	NA	YES
Vandalia, IL	Vandalia Municipal Airport	VLA	57.7 - 075°	NA	YES
Perryville, MO	Perryville Municipal Airport	K02	57.8 - 156°	NA	YES
Farmington, MO	Farmington Regional Airport	FAM	59.3 - 184°	NA	YES
Bismarck, MO	Bismarck Memorial Airport	H57	60.9 - 192°	NA	NA
Centralia, IL	Centralia Municipal Airport	ENL	61.1 - 103°	NA	YES
Jacksonville, IL	Jacksonville Municipal Airport	IJX	61.9 - 006°	NA	YES
Cuba, MO	Cuba Municipal Airport	UBX	64.8 - 232°	NA	YES
Salem, IL	Salem-Leckrone Airport	SLO	65.7 - 096°	NA	YES
Pinckneyville, IL	Pinckneyville-Du Quoin Airport	PJY	66.0 - 135°	NA	YES
Taylorville, IL	Taylorville Municipal Airport	TAZ	67.4 - 046°	NA	YES
Fredricktown, MO	Fredricktown Regional Airport	H88	68.7 - 178°	NA	YES
Linn, MO	Linn State Technical College Airport	1H3	70.3 - 257°	NA	NA
Mexico, MO	Mexico Memorial Airport	H41	72.4 - 291°	NA	YES
Springfield, IL	Capital Airport	SPI	73.1 - 026°	SPI	YES
Beardstown, IL	Greater Beardstown Airport	K06	73.6 - 359°	NA	NA
Mount Vernon, IL	Mount Vernon Airport	MVN	75.0 - 110°	NA	YES

FIGURE 3-7. RADAR DATA FOR STL EAST FLOW

FIGURE 3-8. RADAR DATA FOR WEST FLOW

3.6 EXISTING NOISE ENVIRONMENT

Noise Measurement Program

A field noise measurement program was conducted at select sites throughout the MAP study to provide a sample of ambient and cumulative noise values (see Appendix C).

The primary focus of the measurement program was to collect and calculate the day/night average noise levels (DNL) at each specific site for a 24-hour period. At each noise measurement site, DNL was calculated by adding the sound exposure during the daytime hours (0700-2200) plus ten times the sound exposure occurring during the nighttime (2200-0700) and averaging this total sum by the number of seconds during a 24 hour day. The multiplication factor of 10 applied to the nighttime exposure accounts for the lower ambient noise levels during that time as well as the intrusiveness of noise while people are trying to sleep. Note that these are not yearly DNL values which represent annual average conditions used to depict DNL noise contours. Nonetheless, measured DNL over a 24-hour period is a useful tool to compare and validate yearly DNL values obtained through the noise modeling.

In addition to DNL several other metrics were also computed from the measured data as supplemental information. These include the following:

- L_{50} – Sound level at which 50% of the measured 1-second samples are above and 50% are below. This is generally considered to be an estimation of background noise levels by FAA.

- Aircraft $Leq_{(obs)}$ – Sound level of the observed aircraft events averaged across the observation time period (obs).

- Non-Aircraft $Leq_{(obs)}$ – Average sound level of noise during observation time less the aircraft event noise.

- Total $Leq_{(obs)}$ – Total average equivalent sound level during the observation time.

- Aircraft Lmax – Range of maximum sound level associated with observed aircraft events

Table 3.6 lists the 20 measurement locations selected for this program along with their general land use type. Figure 3.9 illustrates the locations of all the sites. Appendix C, Noise Measurements, provides a detailed description of each of the sites including more information regarding location, study area position, land use type, and some measurement results statistics.

Table 3.7 provides a summary of the noise levels recorded during the measurement period for each site. The data for each site is presented in terms of the DNL values for each individual measurement day as well as the cumulative DNL value for the entire measurement duration at the site. Similarly, the L50 values for each site are also presented.

TABLE 3.6. MEASUREMENT SITE LOCATION SUMMARY

Site	Name	Latitude	Longitude	Land Use	Dates Measured
Site 1	Cuivre River State Park	39.0253	-90.9389	Rural Park	10/6/03 - 10/8/03
Site 2	Godar-Diamond WMA*	39.1983	-90.6128	Rural Park - WMA*	10/1/03 - 10/3/03
Site 3	Green County Fairgrounds	39.2989	-90.3850	Rural Park	9/29/03 - 10/1/03
Site 4	Pere Marquette State Park	38.9731	-90.5425	Rural Park	10/1/03 - 10/3/03
Site 5	Ebaugh County Park	39.6878	-90.4589	Rural Park	9/29/03 - 10/1/03
Site 6	Godfrey, IL Residence	38.9289	-90.2214	Rural Residential	10/3/03 - 10/6/03
Site 7	Horseshoe Lake State Park	38.6978	-90.0664	Rural Park	10/1/03 - 10/3/03
Site 8	South Shore State Park	38.6283	-89.2922	Rural Park	9/29/03 - 10/1/03
Site 9	Lebanon, IL Residence	38.6175	-89.8197	Suburban Residential	9/29/03 - 10/1/03
Site 10	Belleville, IL Residence	38.5236	-90.0547	Rural Residential	10/3/03 - 10/6/03
Site 11	Fort de Chartres SHS*	38.0831	-90.1667	Rural Park - SHS*	10/6/03 - 10/8/03
Site 12	Webster Groves, MO Residence	38.6000	-90.3300	Urban Residential	10/6/03 - 10/8/03
Site 13	Wildwood, MO Residence	38.6400	-90.6700	Rural Residential	10/8/03 - 10/10/03
Site 14	Babler State Park	38.6264	-90.6928	Rural Park	10/8/03 - 10/10/03
Site 15	Washington City Park	38.5647	-91.0228	Suburban Park	10/8/03 - 10/10/03
Site 16	Foristell, MO Residence	38.7833	-90.9406	Rural Residential	10/6/03 - 10/8/03
Site 17	St Charles, MO Residence	38.7194	-90.5597	Suburban Residential	10/3/03 - 10/6/03
Site 18	N St Charles, MO Residence	38.8022	-90.5203	Suburban Residential	10/8/03 - 10/10/03
Site 19	Silver Lake Park	38.7694	-89.6944	Rural Park	10/3/03 - 10/6/03
Site 20	Glen Carbon, IL Residence	38.7472	-89.9542	Suburban Residential	10/1/03 - 10/3/03

* WMA - Wildlife Management Area, SHS - State Historical Site

FIGURE 3.9. NOISE MEASUREMENT LOCATIONS

TABLE 3.7. NOISE MEASUREMENT SUMMARY

	Measured DNL			Measured L_{50}		
Site #	**Day 1**	**Day 2**	**Total**	**Day 1**	**Day 2**	**Total**
01	52.5	52.3	52.4	42.6	43.5	43.1
02	53.3*	53.1	53.2	42.6	42.2	42.4
03	53.0	54.0	53.5	45.6	44.2	44.7
04	48.4	48.9	48.7	40.4	40.1	40.2
05	54.8	54.9	54.9	48.4	47.1	47.6
06	52.9	56.3*	54.9	44.1	48.5	45.9
07	60.3*	62.4	61.5	53.1	53.3	53.2
08	50.6	56.4	54.4	41.3	39.6	40.5
09	50.0*	51.1*	50.6	42.1	40.2	41.2
10	51.0	55.2	53.6	42.1	43.5	42.5
11	49.4	49.1	49.3	44.7	43.9	44.2
12	63.0	64.0*	63.5	55.3	56.2	55.7
13	60.5	59.7	60.1	52.3	50.8	51.6
14	58.7	50.6	56.3	51.2	41.1	44.3
15	61.3	62.7	62.0	45.0	43.8	44.6
16	50.5*	48.7*	49.7	41.0	41.4	41.2
17	53.1	55.0	54.1	44.6	46.6	45.7
18	59.3	56.1*	58.0	50.7	48.1	49.8
19	52.3*	54.1	53.3	46.0	48.8	47.3
20	60.4	54.1	58.3	52.8	48.2	50.6

* Denotes values where anomalous noise events were removed.

Table 3.8 presents a summary of the noise levels associated with the observed aircraft events for each measurement site. The duration of the observations, the number of aircraft events, and the range of the maximum aircraft noise levels are presented along with the average noise values. The time and duration of each aircraft event was used to separate out the aircraft noise from other noise recorded during each observation period. This allowed for the calculation of the average noise levels associated with only the aircraft events for comparison to the average levels from other sources during the observation periods.

In addition to the noise modeling analysis presented in the next chapter, the noise measurement data presented above has been used in conjunction with the noise modeling computations for the measurement sites to provide a general understanding of the effects of the proposed alternatives at each location. By including the measured noise along with the modeled changes for each alternative, an estimate of the contribution of each alternative to the total noise picture at each site is possible. Accordingly, aircraft noise from modeled aircraft operations, as well as other VFR operations can be considered. While this type of analysis can only be done specific to each noise measurement location, it does provide some insight as to each of the alternatives contribution to the total noise in the area. This analysis is detailed in Appendix E.

3.7 AIR QUALITY

This section describes the existing air quality conditions within the project study area.

TABLE 3.8. OBSERVED AIRCRAFT NOISE SUMMARY

Site	Observation Duration (hrs)	No. of Aircraft Observed	Aircraft L_{MAX} Range (dBA)	Aircraft Leq (dBA)	Non Aircraft Leq (dBA)	Total Leq (dBA)
01	5.4	43	40.7 - 57.3	36.1	42.3	43.2
02	3.0	7	46.1 - 60.6	35.1	51.7	51.8
03	4.0	9	46.4 - 56.2	33.8	49.4	49.6
04	4.2	36	43.0 - 62.7	37.7	45.0	45.7
05	4.5	14	48.8 - 57.8	37.2	49.3	49.6
06	0.0	0	n/a	n/a	n/a	n/a
07	4.4	53	51.0 - 77.1	51.9	57.6	58.7
08	6.0	38	39.6 - 68.8	42.6	45.0	47.0
09	4.2	39	41.5 - 67.3	42.6	48.2	49.3
10	0.0	0	n/a	n/a	n/a	n/a
11	4.0	59	48.7 - 55.4	47.1	47.5	50.4
12	4.1	79	53.1 - 79.6	55.9	54.2	58.1
13	3.0	22	51.5 - 68.4	49.2	59.7	60.0
14	4.8	61	36.1 - 69.4	48.2	59.4	59.8
15	4.3	33	45.1 - 81.8	48.8	52.3	53.9
16	5.4	52	38.6 - 74.0	42.2	43.0	45.6
17	0.0	0	n/a	n/a	n/a	n/a
18	4.4	185	45.9 - 77.7	49.7	44.4	50.8
19	0.0	0	n/a	n/a	n/a	n/a
20	7.0	79	47.7 - 74.7	48.6	51.7	53.4

3.7.1 Pollutants Considered

To protect public health, the U.S. Environmental Protection Agency (EPA), under the authority of the Clean Air Act (CAA), has established National Ambient Air Quality Standards (NAAQS) for six criteria pollutants (Table 3-9). The General Conformity Rule (40 CFR Part 93, Subpart B) identifies the following National Ambient Air Quality Standards (NAAQS) criteria pollutants as pollutants of concern:

- Carbon Monoxide (CO)
- Nitrogen Dioxide (NO_2)
- Particulate matter less than 10 micrometers in diameter (PM-10)
- Particulate matter less than 2.5 micrometers in diameter (PM-2.5)
- Hydrocarbons (HC)/Volatile Organic Compounds (VOCs)
- Sulfur Dioxide (SO_2)
- Ozone (O_3)

These "primary", health-based standards are intended to protect public health, including sensitive populations (asthmatics, the elderly, and children). The EPA requires each state to identify areas that have attained the NAAQS for criteria pollutants. A geographic area in which the levels of an air pollutant meet the health-based, primary standard is designated an "attainment" area. If a geographic area has a level higher than the Federal primary standard for any air pollutant, it is designated a

TABLE 3-9. NATIONAL AMBIENT AIR QUALITY STANDARDS

Criteria Pollutant	Time Basis	Primary Standards	Violation Criteria
Ozone (O_3)			
	1-hour	0.12 ppm	More than 3 days in 3 years
	8-hour	0.08 ppm	More than 1 day/year
Particulate Matter			
PM_{10}	24-hour	150 µg/m^3	More than 1 day/year
	Annual arithmetic mean	50 µg/m^3	If Exceeded
$PM_{2.5}$	24-hour	65 µg/m^3	> 98th % of conc in a year
	Annual arithmetic mean	15 µg/m^3	More than 1 day/year
Carbon Monoxide			
	8-hour	9.0 ppm	More than 1 day/year
	1-hour	35 ppm	More than 1 day/year
Nitrogen Dioxide			
	Annual arithmetic mean	0.053 ppm	If Exceeded
Lead			
	Calendar Quarter	1.5 µg/m^3	If Exceeded
Sulfur Dioxide			
	Annual arithmetic mean	0.030 ppm	If Exceeded
	24-hour	0.14 ppm	More than 1 day/year

ppm = parts per million
Source: U.S. EPA, 2001

"nonattainment" area for that pollutant. Because each of the criteria pollutants is measured separately, a geographic area may be an attainment area for one pollutant and a nonattainment area for another at the same time.

For areas designated as nonattainment, each state must prepare a state implementation plan (SIP) that describes how the area will reduce pollutant levels in order to come into attainment with the NAAQS.

3.7.2 St. Louis Area Attainment

The St. Louis metropolitan area was designated a nonattainment area for the 1-hour ozone standard in 1978. Due to successful implementation of a regional SIP, the area was reclassified as in attainment in January of 2003.

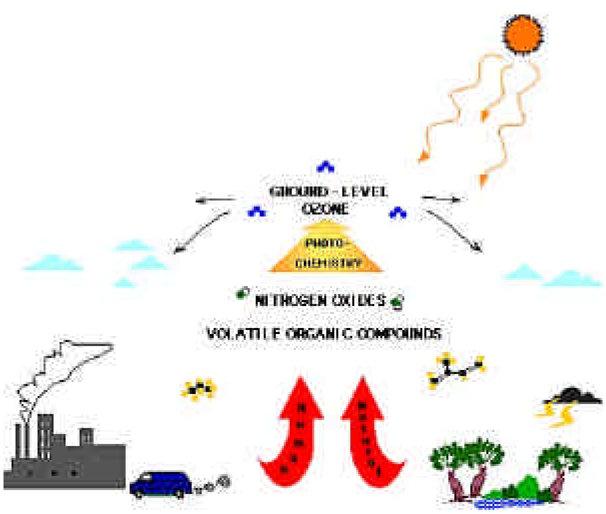
On April 15, 2004, the EPA designated 8-hour ozone nonattainment standards. The 8-hour standard was proposed in 1997 after a review of scientific literature showed that exposure to lower levels of ozone for longer-term can impact human health. The St. Louis area has been designated as a moderate nonattainment area under the 8-hour standard. Table 3.10 contains a list of the counties that comprise the St. Louis nonattainment area.

TABLE 3-10. COUNTIES AND INDEPENDENT CITY INCLUDED IN THE ST. LOUIS 8-HOUR OZONE NONATTAINMENT AREA

Missouri	
Franklin	St. Louis City
Jefferson	St. Louis Co.
St. Charles	
Illinois	
Jersey	Monroe
Madison	St. Clair

Ground level ozone is produced when VOCs react with Nitrogen Oxides (NOx) in the presence of sunlight (Liu, *et al*, 1997) (Figure 3-10). VOCs are organic chemicals that can persist in gaseous forms under normal conditions. These chemicals can be produced from a wide variety of sources but a common source of VOCs is automobile exhaust. Although ozone in the upper atmosphere serves the beneficial purpose of blocking the ultraviolet rays from the sun, ground level ozone is a respiratory irritant.

FIGURE 3-10. VOCS AND OZONE PRODUCTION



Source: The National Oceanic and Atmospheric Administration Aeronomy Laboratory

The St. Louis area was also designated a nonattainment area for the annual 2.5-micron particulate matter standard, which was released on December 17, 2004. Table 3.11 contains a list of the counties that comprise the St. Louis nonattainment area.

TABLE 3-11. COUNTIES AND INDEPENDENT CITY INCLUDED IN THE ST. LOUIS PM 2.5 NONATTAINMENT AREA

Missouri	
Franklin	St. Louis City
Jefferson	St. Louis Co.
St. Charles	
Illinois	
Jersey	Monroe
Madison	St. Clair

Particulate matter is a generic term for a wide variety of particles suspended in the air. It can include fine solids such as dirt, soil dust, pollens, molds, ashes, and soot, as well as aerosols (smog) that are formed in the atmosphere. The major sources of particulate matter are automobiles 23%, other mobile sources (including aircraft) 25%, and domestic wood heating 25%.

Particles less than 2.5 microns in diameter are of particular concern as they are easily inhaled deeply into the lungs where they can be absorbed into the bloodstream or remain embedded for long periods of time. There is no human-health standard for PM 2.5.

The implementation plans that outline how the region will come into conformance with the 1-hour ozone standard and the PM 2.5 standard are still in draft form and have not been implemented.

3.7.3 Regional Lead Nonattainment Areas

Two sections of the study area have been classified as nonattainment areas for lead, the Liberty and Arcadia Townships in Jefferson County, MO, and the city of Herculaneum, in Jefferson County, MO. The primary source of lead in these areas is a series of three lead smelting plants. Emissions controls have been implemented at these plants in accordance with applicable SIPs and in 2000, lead emission rates met the NAAQS primary lead standard at two of the three sites. The Herculaneum plant continues to register lead emission rates that exceed the primary standard. The SIP for the Herculaneum area was amended in 2001 to include additional control requirements. These control requirements have been effective and all air monitoring sites showed lead levels below the NAAQS threshold in early 2002.

3.8 HISTORICAL, ARCHAEOLOGICAL, ARCHITERCTURAL, AND CULTURAL RESOURCES

Several federal laws and regulations protect cultural resources, which include prehistoric, historic, architectural, and traditional cultural properties. A map of all cultural resources within the study area is provided in Figure 3-10. A list of all cultural resources can be found in Appendix D. A brief discussion of the cultural resources within the study area is provided below.

3.8.1 Missouri

The National Register of Historic Places lists 26 archeological sites, 103 historic districts, and 465 historic structures and locations within the Missouri study area counties. These sites include the Gateway Arch and the Anheuser-Busch Brewery.

3.8.2 Illinois

The National Register of Historic Places lists 22 archeological sites, 39 historic districts, 190 historic structures and locations within the Illinois study area counties. These sites include the Lincoln Home National Historic Site and six covered bridges.

3.9 SECTION 303(C) RESOURCES (4F)

The Department of Transportation Act, 49 U.S.C. Section 303(c), formerly known as 4f, states that special effort should be made to preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites. The following sections discuss these resources as they pertain to the project area.

3.9.1 National Park Service Lands

National Park Service Lands include all lands under the management of the National Park Service (NPS). NPS manages a wide variety of resources including national battlefields, cemeteries, heritage corridors, historical parks, historic trails, landmarks, monuments, parks, preserves, recreation areas, reserves, and seashores. A list of all NPS-managed properties is presented in Table 3-12. Figure 3-11 contains a map depicting the locations of these properties.

3.9.2 National Forests

The U.S. Forest Service (USFS) administers National Forests and Grasslands. The mission of the Forest Service is to "sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations." A list of all USFS-managed properties is presented in Table 3-13. Figure 3-11 contains a map depicting the locations of these properties.

3.9.3 National Wildlife Refuge System

The U.S. Fish and Wildlife Service (USFWS) manages the National Wildlife Refuge System with a mission "to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." A list of all USFWS-managed properties is presented in

Table 3-14. Figure 3-11 contains a map depicting the locations of these properties.

3.9.4 State Parks and Forests

Both Illinois and Missouri have designated and managed natural and cultural resource areas for use by their citizens. A list of all state-managed properties is presented in Tables 3-15 and 3-16. Figure 3-11 contains a map depicting the locations of these properties.

3.10 THREATENED AND ENDANGERED SPECIES

Section 7 of the Endangered Species Act (16 U.S.C. 1531-1544) requires that federal agencies insure that any action authorized, funded, or carried out by the agency "is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species."

A threatened species is one that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. An endangered species is one that is in danger of extinction throughout all or a significant portion of its range.

Lists of federally-listed threatened and endangered species are presented in Tables 3-17 and 3-18. In Missouri there are 334 animal species and 614 plant species of concern. Over 500 plants and animal species are listed as species of concern in Illinois.

3.11 MIGRATORY BIRD FLYWAYS

The Mississippi, Missouri, and Illinois River basins provide the backbone for the Mississippi flyway, the largest North American migratory bird route. The flyway extends from the Mississippi delta through the central United States and into southern Ontario. The wetlands and woodlands along the river valleys provide ideal stopovers locations for migrating birds. A generalized map of the flyway is presented in Figure 3-12.

Migratory birds do not generally fly at altitudes greater than 10,000 feet and the majority of avian flights occur at altitudes of less than 3,000 feet. This preference for low-level flight is a major reason why the Mississippi river valley is such a heavily used flyway. The Mississippi river valley provides a 3,000 mile pathway to the north that is uninterrupted by mountains or hills. The Mississippi River basin is used as a flyway for over 40% of all Northern American waterfowl and 326 bird species migrate through or inhabit the river basin.

FIGURE 3-11. PROTECTED CULTURAL AND NATURAL RESOURCES

TABLE 3-12. NATIONAL PARK SERVICE LANDS

Resource Name	City	County	NHRP Listed
Westminster College Gymnasium	Fulton, MO	Callaway	X
Research Cave (archaeological resource)	Portland, MO	Callaway	X
Mark Twain Boyhood Home	Hannibal, MO	Marion County	X
Fort de Chartres	Prairie du Rocher, IL	Randolph	X
Dana (Susan Lawrence) House	Springfield, IL	Sangamon	
Lincoln Home National Historic Site	Springfield, IL	Sangamon	
Lincoln Tomb/Oak Ridge Cemetery	Springfield, IL	Sangamon	
Lindsay (Vachel) House	Springfield, IL	Sangamon	
Old State Capitol	Springfield, IL	Sangamon	X
Goldenrod Showboat (moved from St. Louis)	St. Louis, MO	St. Charles County	X
Cahokia Mounds (archaeological resource)	Collinsville, IL	St. Clair County	X
Church of the Holy Family	Cahokia, IL	St. Clair County	X
Jarrot (Nicholas) Mansion	Cahokia, IL	St. Clair County	X
Anheuser-Busch Brewery	St. Louis, MO	St. Louis City	X
Christ Church Cathedral	St. Louis, MO	St. Louis City	X
Eads Bridge	St. Louis, MO	St. Louis City	X
Erlanger (Joseph) House	St. Louis, MO	St. Louis City	X
Jefferson National Expansion Memorial Historic Site/Gateway Arch	St. Louis, MO	St. Louis City	X
Missouri Botanical Garden	St. Louis, MO	St. Louis City	X
Scott Joplin House	St. Louis, MO	St. Louis City	X
Shelley House	St. Louis, MO	St. Louis City	X
St. Louis Union Station	St. Louis, MO	St. Louis City	X
Steamboat President	St. Louis, MO	St. Louis City	X
Tower Grove Park	St. Louis, MO	St. Louis City	X
U.S. Customshouse and Post Office (Old Post Office)	St. Louis, MO	St. Louis City	X
USS Inaugural (AM-242) WWI Minesweeper	St. Louis, MO	St. Louis City	X
Wainwright Building	St. Louis, MO	St. Louis City	X
Ste. Genevieve Historic District	Genevieve, MO	St. Louis County	X
White Haven (Ulysses S. Grant National Historic Site)	Grantwood Village, MO	St. Louis County	X

Source: http://www.cr.nps.gov/nhl/

TABLE 3-13. U.S. FOREST SERVICE LANDS

Resource Name	Owner	Location	Use
Bell Mountain Wilderness (MTNF Salem District)	USFS	Dent. Co., MO	Multi-use: camping, hiking, nature observation, habitat management
Mark Twain National Forest (Cedar Creek Ranger District)	USFS	Fulton, Mo (Callaway and Boone Counties)	Multi-use: camping, hiking, nature observation, timber harvest, habitat management
Mark Twain National Forest (Fredericktown Ranger District)	USFS	Ste. Genevieve, St. Francois, and Madison Cos., MO	Multi-use: camping, hiking, nature observation, timber harvest, habitat management
Mark Twain National Forest (Potosi Ranger District)	USFS	Crawford, Iron, Reynolds, and Washington Co., MO	Multi-use: camping, hiking, nature observation, timber harvest, habitat management
Mark Twain National Forest (Salem District)	USFS	Crawford, Dent, Iron, Reynolds, and Shannon Cos., MO	Multi-use: camping, hiking, nature observation, timber harvest, habitat management
Rock Pile Mountain Wilderness (MTNF Fredericktown Ranger District)	USFS	Madison Co., MO	Multi-use: camping, hiking, nature observation, habitat management
Shawnee National Forest	USFS	Jackson, Union, and Alexander Cos., IL	Multi-use: camping, hiking, nature observation, timber harvest, habitat management
Silver Mines Recreational Area (MTNF Fredericktown District)	USFS	Madison Co., MO	Multi-use: camping, hiking, nature observation

Source: http://www.fs.fed.us/

TABLE 3-14. U.S. FISH AND WILDLIFE SERVICE LANDS

Resource Name	Owner	Location	Use
Mark Twain National Wildlife Refuge	USFWS	MO (Mississippi River)	Wildlife/waterfowl/habitat management/refuge, hunting/fishing (limited areas), wildlife/waterfowl observation
Upper Mississippi River National Wildlife and Fish Refuge	USFWS	Mississippi River	Wildlife/waterfowl/habitat management/refuge, hunting/fishing (limited areas), wildlife/waterfowl observation
Clarence Cannon National Wildlife Refuge	USFWS	Pike Co., MO (Mississippi River)	Wildlife/waterfowl/habitat management/refuge, hunting/fishing (limited areas), wildlife/waterfowl observation
Meredosia National Wildlife Refuge	USFWS	Brown, Cass, Morgan, Scott, and Greene Counties, IL	Wildlife/waterfowl/habitat management/refuge, hunting/fishing (limited areas), wildlife/waterfowl observation

Source: http://midwest.fws.gov/

TABLE 3-15. ILLINOIS STATE/REGIONAL AREAS

State Parks and Monuments		
Resource Name	**Location**	**Use**
Beaver Dam State Park	Macoupin Co.	Archery, camping, cross-country skiing, fishing, hiking, hunting, picnicking, wildlife/nature observation
Elden Hazlet State Park (Carlyle Lake)	Clinton Co.	Boating, camping, fishing, hiking, hunting, picnicking
Frank Holten State Park	East St. Louis	Boating, fishing, golfing, picnicking, nature observation
Fort de Chartres State Historic Site	Randolph, Co.	Hiking, history
Horseshoe Lake State Park	Madison Co.	Boating, camping, fishing, hiking, hunting, picnicking, wildlife/nature observation
Lake Murphysboro State Park	Jackson Co.	Archery, boating, camping, fishing, hiking, history, picnicking, wildlife/nature observation
Pere Marquette State Park	Jersey Co.	Biking, bird watching, boating, camping, fishing, hiking, horseback riding, hunting, picnicking
Pyramid State Park	Perry Co.	Boating, camping, fishing, hiking, horseback riding, hunting, picnicking
Ramsey Lake State Park	Fayette Co.	Boating, camping, cross-country skiing, fishing, hunting, picnicking, snowmobiling
Sangchris Lake State Park	Christian Co.	Boating, camping, fishing, hiking, hunting
Siloam Springs State Park	Adams and Brown Counties	Boating, camping, fishing, hiking, horseback riding, hunting, picnicking
South Shore State Park (Carlyle Lake)	Clinton Co.	Boating, camping, hiking, picnicking, swimming
Stephen A. Forbes State Park	Marion Co.	Boating, camping, fishing, hiking, horseback riding, hunting, picnicking, swimming

TABLE 3-15 (CONTINUED). ILLINOIS STATE/REGIONAL AREAS

State Waterfowl and Wildlife Management and Conservation Areas		
Resource Name	**Location**	**Use**
Batchtown Waterfowl Management Area	Calhoun, Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Bend Lake State Waterfowl Management Area	Jefferson Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Bend Lake State Wildlife Management Area	Jefferson Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Bend Lake State Wildlife Refuge	Franklin and Jefferson Counties	Wildlife/waterfowl habitat, nature observation

Calhoun County Conservation Area (Rip Rap Landing)	Calhoun Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Calhoun Point Waterfowl Management Area	Jersey Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Carlyle Lake State Fish and Wildlife Management Area	Bond, Clinton, and Fayette Counties	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Fuller Lake Wildlife Management Area	Jersey Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Godar-Diamond Waterfowl Management Area	Greene Co. IL (Illinois River)	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Jim Edgar Panther Creek State Fish and Wildlife Area	Cass Co., IL	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Kaskaskia River State Fish and Wildlife Area	Monroe, Randolph, St. Clair Counties	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Kincaid Lake State Fish and Wildlife Area	Jackson Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Mount Vernon Game Farm	Jefferson Co.	Wildlife/waterfowl habitat, hunting
Panther Creek Conservation Area	Cass Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Turkey Bluffs State Fish and Wildlife Area	Randolph Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Upper Mississippi River Conservation Area	Pike Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Washington County Conservation Area	Washington Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation

Source: http://www.dnr.state.il.us/lands/landmgt/parks

TABLE 3-16. MISSOURI STATE/REGIONAL AREAS

State Parks and Monuments		
Resource Name	**Location**	**Use**
Castlewood State Park	St. Louis Co.	Hiking, history, wildlife/nature observation
Cuivre River State Park	Lincoln Co.	Boating, camping, fishing, hiking, swimming, wildlife/nature observation
Dr. Edmund A. Bahler Memorial State Park	St. Louis Co.	Undetermined
Elephant Rocks State Park	Graniteville, (Iron Co.)	Hiking, history, picnicking, wildlife/nature
Frank Reifsnider State Forest	Warrenton, MO (Warren Co.)	Camping, hiking, wildlife/nature observation, wildlife/timber/habitat management
Graham Cave State Park	Montgomery Co.	Boating, camping, fishing, history, picnicking
Jefferson Barracks Historic Park	Lemay, (St. Louis Co.)	Hiking, history
Johnsons Shut-Ins State Park	Reynolds Co.	Camping, hiking, rock climbing, swimming, wildlife/nature observation

Meramec State Park	Franklin Co.	Camping, fishing, hiking, picnicking, rafting,
Onondaga Cave State Park	Crawford Co.	Camping, canoeing, hiking, picnicking
Roberstville State Park	Robertsville, (Franklin Co.)	Boating, camping, canoeing, fishing, picnicking, scenic
Route 66 State Park	St. Louis Co.	Biking, bird watching, hiking, history, horseback riding, picnicking
St. Francois State Park	St. Francois Co.	Camping, canoeing, hiking, history, picnicking, wildlife/nature observation
St. Joe State Park	St. Francois Co.	Biking, camping, fishing, horseback riding, history, off-road vehicles (trails), picnicking
Taum Sauk Mountain State Park	Reynolds and Iron Counties	Hiking, picnicking, scenic
Washington State Park	Potosi (Washington Co.)	Camping, fishing, hiking, history, picnicking, swimming

TABLE 3-16 (CONTINUED). MISSOURI STATE/REGIONAL AREAS

State Waterfowl/Wildlife Management and Conservation Areas		
Resource Name	**Location**	**Use**
Amidon Memorial Conservation Area	Madison Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
August A. Busch Memorial Conservation Area	St. Charles Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
B.K. Leach Memorial Conservation Area	Lincoln Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Ben Branch Lake Conservation Area	Osage Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Cannon Conservation Area	Gasconade Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Daniel Boone Conservation Area	Warren Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Edward Anderson Conservation Area	Ralls Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Forest 44 Conservation Area	St. Louis Co	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Huzzah Conservation Area	Crawford Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Indian Trail Conservation Area	Dent Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Ketcherside Mountain Conservation Area	Iron Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Little Indian Creek Conservation Area	Franklin and Washington Counties	Wildlife/waterfowl habitat, hunting/fishing, nature observation

Little Lost Creek Conservation Area	Warren Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Long Ridge Conservation Area	Franklin Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Marais Temps Clair Conservation Area	St. Charles Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Marshall I. Diggs Conservation Area	Audrain and Montgomery Counties	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Pacific Palisade Conservation Area	Jefferson Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Pea Ridge Conservation Area	Washington, Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Proffit Mountain Conservation Area	Iron and Reynolds Counties	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Ranacker Conservation Area	Pike Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Reform Conservation Area	Callaway Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Seventy-six Conservation Area	Perry Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Spring Creek Gap Conservation Area	Maries Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Ted Shanks Conservation Area	Pike Co. (Mississippi River)	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Upper Mississippi Conservation Area	Pike and St. Charles Counties (Mississippi River)	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Vonaventure State Memorial Forest and Wildlife Area	Lincoln Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Weldon Spring Conservation Area	St. Charles Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Whetstone Creek Conservation Area	Williamsburg, (Callaway Co)	Wildlife/waterfowl habitat, hunting/fishing, nature observation
William G. and E. P. White Memorial Wildlife Area	Lincoln, Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
William R. Logan Conservation Area	Lincoln Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation
Young Conservation Area	Jefferson Co.	Wildlife/waterfowl habitat, hunting/fishing, nature observation

Source: http://www.mostateparks.com

FIGURE 3-12. MISSISSIPPI MIGRATORY BIRD FLYWAY

TABLE 3-17. FEDERALLY LISTED THREATENED AND ENDANGERED FAUNA

Status	Common Name	Latin Name	State Listed Missouri	State Listed Illinois
E	Bat, gray	*Myotis grisescens*	v	v
E	Bat, Indiana	*Myotis sodalis*	v	v
E	Higgins eye (pearlymussel)	*Lampsilis higginsi*	v	v
E	Mucket, pink (pearlymussel)	*Lampsilis abrupta*	v	v
E	Plover, piping (Great Lakes watershed)	*Charadrius melodus*	v	v
E	Pocketbook, fat	*Potamilus capax*	v	v
E	Sturgeon, pallid	*Scaphirhynchus albus*	v	v
E	Tern, least (interior pop.)	*Sterna antillarum*	v	v
E	Amphipod, Illinois cave	*Gammarus acherondytes*		v
E	Butterfly, Karner blue	*Lycaeides melissa samuelis*		v
E	Dragonfly, Hine's emerald	*Somatochlora hineana*		v
E	Fanshell	*Cyprogenia stegaria*		v
E	Pimpleback, orangefoot (pearlymussel)	*Plethobasus cooperianus*		v
E	Puma, eastern	*Felis concolor couguar*		v
E	Snail, Iowa Pleistocene	*Discus macclintocki*		v
E	Mussel, scaleshell	*Leptodea leptodon*	v	
E	Pearlymussel, Curtis	*Epioblasma florentina curtisii*	v	
E	Shiner, Topeka	*Notropis Topeka (tristis)*	v	
E	Bat, Ozark big-eared	*Corynorhinus (Plecotus) townsendii*	v	
T	Eagle, bald	*Haliaeetus leucocephalus*	v	v
T	Wolf, gray	*Canis lupus*	v	v
T	Madtom, Neosho	*Noturus placidus*	v	
T	Cavefish, Ozark	*Amblyopsis rosae*	v	
T	Darter, Niangua	*Etheostoma nianguae*	v	
XN	Blossom, tubercled (pearlymussel)	*Epioblasma torulosa torulosa*		v
XN	Catspaw (purple cat's paw pearlymussel)	*Epioblasma obliquata obliquata*		v

Key: E – Endangered T – Threatened XN – Experimental Population (Non-Essential)

TABLE 3-18. FEDERALLY LISTED THREATENED AND ENDANGERED FLORA

Status	Common Name	Latin Name	State Listed	
			Missouri	Illinois
E	Prairie-clover, leafy	*Dalea foliosa*		v
E	Bladderpod, Missouri	*Lesquerella filiformis*	v	
E	Pondberry	*Lindera melissifolia*	v	
E	Clover, running buffalo	*Trifolium stoloniferum*	v	
T	Milkweed, Mead's	*Asclepias meadii*	v	v
T	Aster, decurrent false	*Boltonia decurrens*	v	v
T	Thistle, Pitcher's	*Cirsium pitcheri*		v
T	Daisy, lakeside	*Hymenoxys herbacea*		v
T	Pogonia, small whorled	*Isotria medeoloides*		v
T	Bush-clover, prairie	*Lespedeza leptostachya*		v
T	Orchid, eastern prairie fringed	*Platanthera leucophaea*		v
T	Geocarpon minimum	*Geocarpon minimum*	v	
T	Sneezeweed, Virginia	*Helenium virginicum*	v	
T	Orchid, western prairie fringed	*Platanthera praeclara*	v	

3.12 WILD AND SCENIC RIVERS

The Wild and Scenic Rivers Act of 1968 (PL.90-542) was instituted to protect and preserve in free-flowing condition, river segments which with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values. The Wild and Scenic Rivers Act limits development within 1,000 feet of segments of a river designated as Wild or Scenic.

Missouri and Illinois each have one river segment designated a Wild or Scenic River by the Department of Interior. The Eleven Point River, between Thomasville in south central Missouri, and the Highway 142 Bridge, to the southeast has been protected due to its scenic qualities. No portion of the river flows through the study area.

A 17.1-mile segment of the middle fork of the Vermillion River beginning at Collision, Illinois, along the Indiana border and flowing south to the Conrail Railroad crossing north of U.S. Highway 150 has been protected due to its scenic qualities. No portion of the river flows through the study area.

CHAPTER IV – ENVIRONMENTAL CONSEQUENCES

This chapter describes the environmental consequences of each of the alternatives selected for detailed consideration in accordance with FAA Order 1050.1E (see Chapter 2 and Appendix A for alternative selection process).

4.1 NOISE

The community exposure to aircraft noise attributable to the Future Baseline conditions and each proposed alternative is presented in this section. The analysis includes determination of aircraft noise exposure in the study area as forecasted for the years 2006 and 2013. Aircraft noise is often the most noticeable environmental effect associated with aviation projects. If the sound is sufficiently loud or frequent in occurrence, it may interfere with various human activities or be considered non-compatible.

4.1.1 Aircraft Noise Analysis

This modeling analysis showed how aircraft noise would change with each proposed alternative in comparison to the Future Baseline conditions. A detailed analysis of noise from aircraft operating between the surface and 18,000 feet above ground level (AGL) was performed at 115,325 locations throughout the 23,400 square mile study area. The noise analysis evaluated conditions for specific locations on the ground based on population centroids (centers of census tracts) and grid points (parks, historic sites, etc) using the Day/Night Average Sound Level (DNL) for aircraft operations. The number of people exposed to noise was estimated as the number residing in the census tract corresponding to the centroid (based on 2000 Census Data). Population centroids are center points of census tracts, which are statistical subdivisions of a county and do not cross county boundaries. The spatial size of census tracts varies widely depending on the density of the population. For this analysis, the population centroid counts represented the maximum potential population within the census tract that could be exposed to modeled DNL levels. The actual number of people impacted can be less than the total population represented by a single centroid because noise levels actually will vary throughout the census tract. A total number of 80,561 centroids were analyzed. Additionally, DNL noise levels are also calculated for some 30,000+ uniform grid locations spaced one mile apart covering the entire MAP study area.

Noise exposure contours which are typically used in aircraft noise analysis near a specific airport were not calculated for this study because the computer model (FAA's INM) normally used to assess noise impacts cannot be applied to widespread areas, nor can the INM model evaluate high-altitude flight route changes. Noise exposure contours only describe noise impacts of arrivals and departures operating within the immediate vicinity (3-5 miles) of the study airport for aircraft operating below 3,000 feet above the ground. The FAA's Noise Integrated Routing System (NIRS) provides a more detailed analysis tool to evaluate the effects of high-altitude airspace changes from the ground level to 18,000 feet AGL on noise sensitive areas over a large study area.

It is expected that, if approved, the proposed project would be implemented sometime in 2006 in conjunction with the opening of the new W-1W parallel runway at STL. Consequently, future year forecasts of aircraft operations were prepared for 2006. This forecast work resulted in the development of an average daily flight schedule for all airports modeled in the study area. In order to provide a look at the potential long-term effects of the proposed action, operations forecasts and environmental analyses were also prepared for the conditions expected in 2013. Due to uncertainties surrounding STL and the aviation industry (see Chapter 1), an out-year seven years from implementation, 2013, was selected so that conditions could return to equilibrium.

The following sections provide a brief summary of the methodology used and the resulting change in noise levels. Appendix E provides detailed information related to the methodology and assumptions used in preparing the noise analysis, statistical information used in the development of the predicted noise levels, and information related to the impact of noise on people located within the study area. Appendix F provides background information on noise metrics, aircraft noise analysis, and aircraft noise effects on human beings.

4.1.2 Noise Model

Five airports within the MAP study area were fully evaluated in this analysis. In addition, over flight traffic transiting the study area below 18,000 ft MSL altitude was also included in the modeling. STL was the major airport modeled and the reliever airports Spirit of St. Louis (SUS) SUS, St. Louis Downtown (CPS), Mid-America (BLV) St. Louis Regional (ALN) were also modeled.

4.1.3 Input Data

NIRS requires a variety of user-supplied input data including a mathematical description of the airport runways, operations by aircraft type, flight tracks, and runway utilization. Airport layouts within the study area are used as the source for runway descriptions. Operation levels, a mix of different aircraft types (fleet mix), and airspace segment and stage length (trip length) are based on the design day flight schedules developed for each planning timeframe. Design day flight schedules contain information about the following: the type of flight (scheduled and nonscheduled commercial passenger, air cargo, general aviation, or military); type of aircraft; arrival and departure times; the origin and destination of the flight (domestic or international); the operator of the flight; and the local airspace arrival and departure segments.

The direction and path the aircraft fly (flight tracks) throughout the study area for all five airports modeled were based on actual flight radar data, drawn in collaboration with FAA controllers, and dispersed using statistical analysis of the radar tracks making up a specific route or procedure.

The day and night distribution of operations were provided in the design day schedules developed in the operational forecasting effort. These distributions were then compared to the air traffic control operational simulation (i.e., Total Airspace and Airport Modeler – TAAM) output for each proposed alternative and adjusted for delay as necessary. The relevance of maintaining correct nighttime proportions lies within the DNL metric’s weighting of nighttime noise levels by 10 dB. This is done to take into account the lower ambient noise levels occurring at night as well as the intrusive nature of noise when people are trying to sleep. In essence, one nighttime flight equates to ten daytime flights. This addition of noise energy is accomplished in the NIRS model itself

The runway use percentages define which runways are to be used for arrivals and departures on an average annual basis. Since STL is the primary airport within the study area, the runway use patterns used here determine how controllers move aircraft through area airspace. Consequently, runway use patterns for other airports within the study area are based on how they relate to STL’s runway use. For STL, the runway usage parameters for the future conditions, including the future baseline, were primarily developed based on the runway utilization modeled in the FAA’s EIS document for the W-1W runway. The percentages from the EIS were combined with the projected design day schedules to develop final runway use percentage estimates for the future conditions in 2006 and 2013. The average annual runway use proportions at the satellite airports were developed from a 77-day sample of radar flight tracks for each airport

4.1.4 Noise Impact Criteria

The FAA has considered the matter of threshold levels above which aircraft noise causes a significant adverse impact on people. The agency has established 65 DNL as the threshold above which aircraft noise is considered to be not compatible in residential areas. In addition, the FAA has determined that a significant impact occurs if a proposed action would result in an increase of 1.5 DNL or more on any noise-sensitive area within the 65 DNL exposure level.

In 1992, the Federal Interagency Committee on Noise (FICON) recommended that noise increases of 3 dB or more between DNL 60 and 65 dB be evaluated in environmental studies when increases of 1.5 DNL or more occur at noise-sensitive locations at or above 65 DNL. Increases of this magnitude below 65 DNL are not to be considered as "significant impacts," but they are to receive consideration. The FAA adopted FICON's recommendation into FAA Order 1050.1E.

In 1990, the FAA issued a noise screening procedure for determining whether certain airspace actions above 3,000 feet above ground level (AGL) might increase DNL levels by five decibels or more. The procedure served as a response to FAA experience that increases in noise of 5 dB or more at cumulative levels well below 65 DNL could be disturbing to people and become a source of public concern. In the Environmental Impact Statement for the Expanded East Coast Plan (EECP), the FAA evaluated noise levels down to the 45 DNL level for potential increases in DNL noise exposure of 5 dB or more. In the EECP study, the FAA determined that the 45 DNL level was the minimum level at which noise needed to be considered because "even distant ambient noise sources and natural sounds such as wind in trees can easily exceed this [45 DNL] value." This threshold of change was subsequently used in the Chicago Terminal Airspace Project (CTAP) EIS and the Potomac Consolidated TRACON Airspace Redesign EIS. The FAA formalized the use of this threshold of change in the recent release of FAA Order 1050.1E.

For the purpose of this EA, increases of 3 DNL between 60 and 65 DNL are considered "slight to moderate impacts" as are increases of 5 DNL or greater at levels between 45 DNL to 60 DNL. The increase in noise at these levels is enough to be noticeable and potentially disturbing to some people, but the cumulative noise level is not high enough to constitute a "significant impact." Table 4.1 summarizes the criteria utilized to assess the level of change in noise exposure attributable to the proposed alternatives.

4.1.5 Aircraft Noise Impact – NIRS Output Analysis

The NIRS noise analysis focuses on aircraft noise exposure in areas affected by DNL 45 and greater. NIRS evaluates the maximum potential population exposed to noise based on the criteria presented in Table 4.1. Table 4.2 presents the maximum potential population exposed to noise by DNL ranges for the Future Baseline and each of the proposed alternatives.

TABLE 4.1. CRITERIA FOR DETERMINING IMPACT OF INCREASES IN AIRCRAFT NOISE

DNL Noise Exposure With proposed action	Minimum Increase in DNL With proposed action	Level of Impact	Reference
65 dB or higher	1.5 dB	Significant	FAA Order 1050.1E, App. A, 14.3 Part 150, Sec. 150.21(2)(d) FICON 1992
60 to 65 dB	3.0 dB	Slight to Moderate	FAA Order 1050.1E, App A, 14.4c FICON 1992
45 to 60 dB	5.0 dB	Slight to Moderate	FAA Order 1050.1E, App A, 14.5e FAA Notice 7210.360

TABLE 4.2. MAXIMUM POTENTIAL POPULATION EXPOSED TO AIRCRAFT NOISE IN MAP STUDY AREA

	Future Basline	Alternative 4A		Alternative 6		Alternative 10	
	Exposure	Exposure	Change	Exposure	Change	Exposure	Change
2006 Forecast							
45-60 DNL	698,688	745,058	6.6%	664,674	-4.9%	704,307	0.8%
60-65 DNL	31,582	31,253	-1.0%	30,771	-2.6%	31,547	-0.1%
65+ DNL	13,595	13,535	-0.4%	13,551	-0.3%	12,894	-5.2%
Total Above 45 DNL	**743,865**	**789,846**	6.2%	**708,996**	-4.7%	**748,748**	0.7%
2013 Forecast							
45-60 DNL	745,615	776,941	4.2%	688,118	-7.7%	737,622	-1.1%
60-65 DNL	32,407	32,374	-0.1%	31,595	-2.5%	32,587	0.6%
65+ DNL	14,247	13,883	-2.6%	14,464	1.5%	13,780	-3.3%
Total Above 45 DNL	**792,269**	**823,198**	3.9%	**734,177**	-7.3%	**783,989**	-1.0%

Future Baseline

As shown in Table 4.2, 743,865 people within the MAP study area are expected to be exposed to noise levels of 45 DNL and greater due to aircraft noise in 2006 if no design changes are made. By the year 2013, it is estimated that the population exposed to noise levels above 45 DNL will increase by 48,404 to 792,269 persons. The number of people exposed to noise of 65 DNL and greater is expected to increase by 652 persons between 2006 and 2013 in the Future Baseline scenario. These increases are partially due to the expected growth in aircraft operations in the area through 2013, and the associated increases in noise, and partially due to the forecast population growth in the MAP area through 2013.

The future baseline includes the W-IW EIS procedures which have been previously analyzed and disclosed during the Runway EIS process.

Alternatives

The noise exposure associated with each of the proposed alternatives was evaluated against the Future Baseline scenario for each of the future years. Table 4.2 also presents the resulting maximum population potentially exposed to various noise levels for each proposed alternative in each future year. As the table indicates, each of the proposed alternatives provides varying degrees of change in potential population exposed to various levels of noise in the study area. However, in order to fully understand the importance of the changes in noise exposure associated with each proposed alternative, it is necessary to evaluate the population exposure in terms of the FAA's noise impact criteria discussed in the previous section. The following paragraphs present a summary of the NIRS analysis results for each proposed alternative in each of the future years. A more detailed discussion of each proposed alternative's route and procedure changes from the Future Baseline condition is presented in Appendix E of this document. The appendix also provides discussion related to the changes in the NIRS input data to model the alternative routes and procedures along with a discussion of the resulting noise.

Alternative 4A

The route and procedural changes associated with Alternative 4A result in a 45,981 increase in the number of persons expected to be exposed to noise levels of 45 DNL or greater in 2006. By 2013, Alternative 4A would increase the number of people exposed to aircraft noise above 45 DNL by 31,326 over the Future Baseline conditions. In 2006, the population experiencing 65DNL or higher impacts will have declined by 60 and by 2013, the population exposed will have decreased by 364 people. The analysis details indicate that 86 percent of the population exposed to aircraft noise of 45 DNL or greater would experience similar (less than 1 DNL change) or decreased noise levels throughout the study area with Alternative 4A in 2006. That percentage increases to 88 percent by 2013. Table 4.3 presents a summary of the population exposed to noise levels for Alternative 4A as compared to the Future Baseline scenario for both future years. The table highlights the areas where the alternative caused increases in population exposure for the specific DNL ranges as well as the decreases.

In order to determine the importance of the changes in noise exposure associated with Alternative 4A, an analysis of the changes relative to FAA's noise impact criteria was performed. Figure 4.1 presents a map of the Alternative 4A noise changes for both 2006 and 2013 based on the FAA criteria listed in Table 4.1. Only the non-zero population centroids are shown where the noise exposure changed in such a way that it met the noise threshold criteria discussed in the previous section. Both increases and decreases in noise levels meeting the criteria are shown. The centroids are color coded to identify the criterion that they meet and whether the noise increased or decreased.

As the exhibit indicates, there are no population centroids where the noise levels increased based on the FAA criteria in either 2006 or 2013. The single purple centroid in the exhibit identifies a location where there was a decrease in noise of 5 DNL or more resulting from the alternative procedures in both future years. In 2006 the centroid represents a population of 45 persons and is expected to represent 44 persons by 2013. The centroid lies just east of the Mississippi River and slightly south of I-270. This is an area where the Alternative 4A procedures result in some departure routes being shifted away due to new air traffic sector boundaries.

TABLE 4.3. NOISE IMPACT BY POPULATION - ALTERNATIVE 4A

	Increase		No Change			Decrease
		2006 Future Baseline				
	DNL (dBA)	**<45**	**45-60**	**60-65**	**>65**	**Alternative**
2006 Alternative	**<45**	2,703,274	35,787	0	0	2,739,061
	45-60	81,768	661,663	1,627	0	745,058
	60-65	0	1,238	29,581	434	31,253
	>65	0	0	374	13,161	13,535
	Future Baseline Total	2,785,042	698,688	31,582	13,595	**3,528,907**
		2013 Future Baseline				
	DNL (dBA)	**<45**	**45-60**	**60-65**	**>65**	**Alternative**
2013 Alternative	**<45**	2,762,402	42,357	0	0	2,804,759
	45-60	73,286	702,136	1,519	0	776,941
	60-65	0	1,122	30,654	598	32,374
	>65	0	0	234	13,649	13,883
	Future Baseline Total	2,835,688	745,615	32,407	14,247	**3,627,957**

Alternative 6

The route and procedural changes associated with Alternative 6 result in a nearly 34,869 decrease in the number of persons expected to be exposed to noise levels of 45 DNL or greater in 2006. By 2013, Alternative 6 is expected to further decrease the estimated people exposed to aircraft noise above 45 DNL to about 58,092 below that of the Future Baseline conditions. Within 65 DNL and greater, a population exposure decrease of 44 people is expected in 2006 while an increase of 217 people is evident in 2013 over the Future Baseline scenario. The detailed analysis indicates that approximately 88 percent of the population exposed to aircraft noise of 45 DNL or greater would experience similar (less than 1 DNL change) or decreased noise levels throughout the study area with Alternative 6 in 2006. This percentage is expected to hold in 2013. Table 4.4 presents a summary of the population exposed to noise levels for Alternative 6 as compared to the future baseline scenario for both future years.

Figure 4.2 presents a map of the Alternative 6 noise changes for 2006 based on the FAA criteria listed in Table 4.1. Only the non-zero population centroids are shown where the noise exposure changed in such a way that it met the noise thresholds discussed in the previous section. Both increases and decreases in noise levels meeting the criteria are shown. The centroids are color coded to identify the criterion that they meet and whether the noise increased or decreased.

FIGURE 4.1. CHANGE IN NOISE AT POPULATION CENTROIDS ALTERNATIVE 4A VS FUTURE BASELINE 2006 & 2013

TABLE 4.4. NOISE IMPACT BY POPULATION - ALTERNATIVE 6

	Increase	No Change			Decrease
		2006 Future Baseline			
	DNL (dB)	**<45**	**45-60**	**60-65**	**>65**	**Alternative**
2006 Alternative	**<45**	2,745,948	73,963	0	0	2,819,911
	45-60	39,094	624,361	1,219	0	664,674
	60-65	0	364	29,990	417	30,771
	>65	0	0	373	13,178	13,551
	Future Baseline Total	2,785,042	698,688	31,582	13,595	**3,528,907**
		2013 Future Baseline				
	DNL (dB)	**<45**	**45-60**	**60-65**	**>65**	**Alternative**
2013 Alternative	**<45**	2,787,601	106,179	0	0	2,893,780
	45-60	48,087	638,491	1,540	0	688,118
	60-65	0	945	30,477	173	31,595
	>65	0	0	390	14,074	14,464
	Future Baseline Total	2,835,688	745,615	32,407	14,247	**3,627,957**

As the exhibit indicates, there are both areas of noise increase (yellow centroids) and noise decrease (purple centroids) resulting from the Alternative 6 changes. The yellow centroids depict where the alternative increased the noise exposure by 5 DNL in an area of 45 to 60 DNL. There are 186 yellow centroids, representing a population of 21,596 persons in 2006, clustered in an area along I-70 near St. Peters, MO. A smaller of cluster of 47 purple centroids, representing 5,637 persons, is located just south of I-70 and immediately west of the Missouri river near St. Charles. There is also a single purple centroid representing 45 persons located just east of the Mississippi River in the same location as described for Alternative 4A. These purple centroids represent an area where the alternative decreased the noise exposure by 5 DNL in an area of 45 to 60 DNL. These two clusters of centroids are located in an area where the Alternative 6 procedures result in some departure routes being shifted further west due to new air traffic sector boundaries. This shift is responsible for moving noise away from the area of the purple centroids and into the area where the yellow centroids are located.

Figure 4.3 presents a similar map of the Alternative 6 noise changes for 2013 based on the FAA criteria listed in Table 4.1. As the exhibit indicates, a similar pattern of noise increases and decreases is evident for the Alternative 6 changes in 2013. In 2013, there are 209 yellow centroids, representing a population of 28,306 persons clustered in the area along near St. Peters, MO. The smaller cluster of 50 purple centroids in 2013, which represents 6,645 persons, is located just south of St. Charles. Also, there is the single purple centroid representing 44 persons located just east of the Mississippi River in the same location as described for Alternative 4A. Again, the two clusters of centroids are a result of the Alternative 6 procedures that shift some departure routes further west due to new air traffic sector boundaries.

FIGURE 4.2. CHANGE IN NOISE AT POPULATION CENTROIDS ALTERNATIVE 6 VS FUTURE BASELINE 2006

FIGURE 4.3. CHANGE IN NOISE AT POPULATION CENTROIDS ALTERNATIVE 6 VS FUTURE BASELINE 2013

Alternative 10

The route and procedural changes associated with Alternative 10 result in a 4,883 increase in the number of persons expected to be exposed to noise levels of 45 DNL or greater in 2006. By 2013, however, Alternative 10 is expected to decrease the estimated people exposed to aircraft noise above 45 DNL to approximately 8,280 below that of the Future Baseline conditions. Greater than 65 DNL, a population decrease of 701 persons is expected in 2006 with a decrease of 684 persons expected in 2013 compared to the Future Baseline scenario. The detailed analysis indicates that approximately 95 percent of the population exposed to aircraft noise of 45 DNL or greater would experience similar (less than 1 DNL change) or decreased noise levels throughout the study area with Alternative 10 in 2006. That percentage is expected to hold at 94 percent by 2013. Table 4.5 presents a summary of the population exposed to noise levels for Alternative 6 as compared to the Future Baseline scenario for both future years.

TABLE 4.5. MAXIMUM POTENTIAL POPULATION CHANGE - ALTERNATIVE 10

	Increase		No Change			Decrease
		2006 Future Baseline				
	DNL (dB)	**<45**	**45-60**	**60-65**	**>65**	**Alternative**
2006 Alternative	**<45**	2,750,753	29,406	0	0	2,780,159
	45-60	34,289	668,138	1,880	0	704,307
	60-65	0	1,144	29,693	710	31,547
	>65	0	0	9	12,885	12,894
	Future Baseline Total	2,785,042	698,688	31,582	13,595	**3,528,907**
		2013 Future Baseline				
	DNL (dB)	**<45**	**45-60**	**60-65**	**>65**	**Alternative**
2013 Alternative	**<45**	2,799,104	44,864	0	0	2,843,968
	45-60	36,584	699,466	1,572	0	737,622
	60-65	0	1,285	30,692	610	32,587
	>65	0	0	143	13,637	13,780
	Future Baseline Total	2,835,688	745,615	32,407	14,247	**3,627,957**

The analysis of the changes relative to FAA's noise impact criteria found that there were no changes resulting from Alternative 10, in either 2006 or 2013 that met the thresholds stated in the criterion. Thus, there are no changes at population centroids to map.

4.1.6 Aircraft Noise Impacts– Summary

Table 4.6 presents a summary of the population impacts for each alternative in terms of the FAA threshold criteria. The table is color-coded based on the centroid mapping scheme presented in the earlier exhibits. As the analysis indicates, only Alternative 6 creates changes where noise is increased within one of the FAA criterion thresholds. There are some corresponding decreases of similar magnitude evident in Alternative 6, but they occur over fewer persons than the increases. Alternative 4A provided some very modest noise decreases over a single population point in both future years. There were no notable increases, or decreases in noise exposure resulting from Alternative 10 in either of the future years.

TABLE 4.6. MAP ALTERNATIVES POPULATION IMPACT CHANGE ANALYSIS SUMMARY

	DNL Noise Exposure With Proposed Action 65 dB or higher	60 to 65 dB	45 to 60 dB
Minimum Change in DNL With Alternative	1.5 dB	3.0 dB	5.0 dB
Level of Impact	Significant	Slight to Moderate	Slight to Moderate
Noise Increases			
2006 Forecast			
Alternative 4A	0	0	0
Alternative 6	0	0	21,956
Alternative 10	0	0	0
2013 Forecast			
Alternative 4A	0	0	0
Alternative 6	0	0	28,306
Alternative 10	0	0	0
Noise Decreases			
2006 Forecast			
Alternative 4A	0	0	45
Alternative 6	0	0	5,682
Alternative 10	0	0	0
2013 Forecast			
Alternative 4A	0	0	44
Alternative 6	0	0	6,645
Alternative 10	0	0	0

Overall, the noise exposure analysis indicates that both Alternative 6 and 10 provide some reductions in the total number of persons exposed to aircraft noise above 45 DNL in 2013. Alternative 6 also provides some reduction in 2006 while Alternative 10 generates a very small population increase of persons exposed to aircraft noise above 45 DNL in 2013. Alternative 10 results in larger decrease in the population exposed to aircraft noise greater than 65 DNL in both of the future years. While Alternative 4A also provides some minor reductions in the population exposed to noise greater than 65 DNL, it results in increases in the number of persons exposed to noise above 45 DNL for both years.

The noise analysis determined that none of the project alternatives cause significant increases in noise.

4.2 COMPATIBLE LAND USE

The compatibility of existing and planned land uses with aircraft operations is usually determined based on the extent of noise impacts around an airport.

As described in Section 4.1, Noise, the proposed alternatives do not result in significant noise impacts. Additionally, noise levels in the study area have been compared with the land uses set forth in the FAA land use compatibility table contained in FAA Order 1050.1E. All land uses were found to be compatible. Therefore, it can be concluded that there would be no significant impacts as it relates to compatible land uses.

4.3 SOCIOECONOMIC IMPACTS, ENVIRONMENTAL JUSTICE, AND CHIRLDREN'S ENVIRONMENTAL HEALTH AND SAFETY RISKS

Neither the Future Baseline nor any of the Proposed Project Alternatives would require the relocation of residences or businesses, disrupt local surface transportation patterns, or cause any losses in community tax base. Therefore, there would be no socioeconomic impacts.

No significant environmental impacts for any impact category have been identified for either the Future Baseline or any of the Proposed Project Alternatives. Moreover, those areas that would experience slight to moderate impacts, a 5dB increase in the 45-60 DNL range, do not contain a disproportionately high number of minority populations, low-income populations, or children. As such, it follows that there would be no disproportionately high or adverse impacts for minority populations, low-income populations, or children.

4.4 SECONDARY OR INDUCED IMPACTS

Neither the Future Baseline nor any of the Proposed Project Alternatives would impact patterns in population movement or growth, service demands, or cause changes in business and economic activity. Therefore, there would be no secondary or induced impacts.

4.5 SECTION 303(C) RESOURCES (4F)

Neither the Future Baseline nor any of the Proposed Project Alternatives would require direct or indirect taking of any Section 303(c) property. Therefore, the FAA has determined that there would be no impacts with regard to Section 303(c) resources.

4.6 HISTORICAL, ARCHITECTURAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

Neither the Future Baseline nor any of the Proposed Project Alternatives would require direct or indirect taking of any historical, architectural, archaeological, or cultural resources. Therefore, the FAA has determined that there would be no adverse impact with regard to these environmental impact categories.

4.7 WILD AND SCENIC RIVERS

There are no wild and/or scenic river segments within the study area. Therefore, neither the Future Baseline nor any of the Proposed Project Alternatives have the potential to impact these resources.

4.8 FISH, WILDLIFE, AND PLANTS

4.8.1 Wildlife

Commercial air traffic has increased during an extremely successful period of wildlife management in North America. Aggressive natural resource programs by public and private wildlife management groups have contributed to impressive increases in populations of many species. At the same time, Canada geese, coyotes, deer, and other wildlife have expanded into suburban and urban areas, including airports, and are thriving in response to changes to habitats in these areas. These concurrent increases in air traffic and wildlife populations contribute to an increased probability of wildlife strikes. As these proposed action would primarily alter air traffic routes at greater than 3,000 AGL, the risk of strikes to animals other than birds is minimal.

4.8.2 Impacts on Species other than Migratory Birds

The Missouri Department of Conservation has identified several bird species of concern that are known to occur within the study area (Table 4-7).

TABLE 4.7. BIRD SPECIES OF CONCERN

Species	Federal Status	State Status	State Rank
Bald Eagle	T	E	S2
Peregrine Falcon		E	S1
American Bittern		E	S1
Common Moorhen			S2
Great Egret			S3
King Rail		E	S1
Least Bittern			S2
Sora			S2
Pied-billed Grebe			S2
Cooper's Hawk			S3
Sharp-shinned Hawk			S2
Red-shouldered Hawk			S3

T – Threatened
E – Endangered
S1 – Critically Imperiled
S2 – Imperiled
S3 – Rare

As the proposed action will not result in any construction, it has no impact on the habitat of these species. The Missouri Department of Natural Resources, the Missouri Department of Conservation, and the Illinois Department of Natural Resources concur that the proposed action will have no impact on fish, wildlife, or plants in the study area (see Appendix G – Public Involvement).

4.8.3 Migratory Birds

Migratory birds do not generally fly at altitudes greater than 10,000 feet and the majority of avian flights occur at altitudes of less than 3,000 feet. This preference for low-level flight is a major reason why the Mississippi river valley is such a heavily used flyway. The Mississippi River basin is used as a flyway for over 40% of all Northern American waterfowl and 326 bird species migrate through or inhabit the river basin. The flyway which serves as a major migration route for neotropical migrants and migratory waterfowl, and is a major resting area for birds.

During the period 1990-1999, 27,433 bird strikes were reported to the FAA as provided in

Table 4.8. There has been a marked increase in the number of wildlife strikes reported over the last decade. It has been suggested that the increase in these reports is the result of several factors: an increased awareness of the wildlife strike issue; an increase in aircraft operations; an increase in populations of certain wildlife species that may cause hazards to aircraft; and an increase in the number of strikes.

Table 4.8 Number of Reported Avian Strikes by Identified Species for Civil Aircraft, USA, 1990-1999

Species	10-Year Totals
Ducks, Ducklike and Miscellaneous Swimming Birds	1,486 (Waterfowl 1,447)
Seabirds, Gulls, Etc. (Aerialists)	3,628 (Gulls 3,570)
Long-legged Wading Birds	431
Smaller Wading Birds	433
Birds of Prey	1,666 (Raptors 1,379)
Fowl-like Birds	70
Nonpaserine Land Birds	1,509 (Doves 1,473)
Passerine (Perching) Birds	3,247 (Starlings 636; Blackbirds 730; Sparrows 916)
Total Known Birds	12,470
Unknown Birds	14,929
Total Birds	27,399

Source: Cleary, E.C., Wright, S.E., and Dolbeer, R.A. 2000. FAA National Wildlife Strike Database, Serial Report Number 6.

Bird strikes, will in all likelihood, continue to increase, especially as commercial air traffic increases. However, most of the increase in strikes is likely to be seen below 1,000 feet AGL, as resident bird populations (i.e., Canada geese) use the undeveloped areas that lie adjacent to most airports.

The distribution of reported bird strikes by altitude during the period of 1990 through 1999 is the subject of Table 4.9. About 55 percent of the bird strikes occurred within 100 feet of the ground, 78 percent occurred under 900 feet AGL. Based on historical bird strike patterns in Table 4.9, 91 percent occurred under 3,000 feet AGL and approximately 9 percent of all bird strikes occurred above 3,000 feet AGL.

Table 4.9 Number of Reported Bird Strikes to Civil Aircraft
by Altitude (Feet) Above Ground Level (AGL), USA, 1990-1999

	Reported Strikes		
Altitude of Strike (Feet in AGL)	10-Year Total	% of Total Known	% Cumulative Total
0	8,400	40	40.2
1-99	3,185	15	55.4
100-199	1,395	7	62.1
200-299	910	4	66.5
300-399	662	3	69.7
400-499	378	2	71.5
500-599	701	3	74.8
600-699	222	1	75.9
700-799	160	1	76.6
800-899	304	1	78.1
900-999	127	1	78.7
1,000-1,499	1,006	5	83.5
1,500-1,999	664	3	86.7
2,000-2,499	561	3	89.4
2,500-2,999	304	1	90.8
3,000-3,499	480	2	93.1
3,500-3,999	150	1	93.8
4,000-4,999	381	2	95.7
5,000-9,999	704	3	99.0
10,000-19,999	188	1	99.9
20,000-29,999	8	<1	100.0
≥ 30,000	2	<1	100.0

Source: Cleary, E.C., Wright, S.E., and Dolbeer, R.A. 2000. FAA National Wildlife Strike Database, Serial Report Number 6.

The proposed action presented in this EA involves flight paths that are generally above 3,000 feet AGL. Therefore, based on the available information from the FAA National Wildlife Strike Database, it was concluded that the impacts to bird patterns resulting from the proposed alternatives would be minimal and not significant.

4.9 LIGHT EMISSIONS AND VISUAL IMPACTS

Neither the Future Baseline nor any of the Proposed Action Alternatives would affect the number of aircraft operations or involve the development of physical facilities. The proposed action would occur at altitudes greater than 3,000 feet and would not result in additional light sources. Therefore, there would be no impacts with regard to light emissions or visual impacts.

4.10 AIR QUALITY

The final rule for Determining Conformity of General Federal Actions to State and Federal Implementation Plans (40 CFR Parts 6, 51, and 93) was published in the Federal Register in 1993. In 51.853 (c)(2), the Environmental Protection Agency (EPA) lists actions that are *de minimis* and thus do not require an applicable analysis under this rule. EPA states in the preamble to this regulation that it believes “air traffic control activities and adopting approach, departure, and en route procedures for airport operations” are illustrative of *de minimis* actions.

As such, no further analysis is required. The proposed action fits within this exemption, therefore no significant impacts to air quality

4.11 NATURAL RESOURCES AND ENERGY SUPPLY

The Proposed Project alternatives would not affect the airport's stationary facilities or movement of ground vehicles.

Implementation of the Proposed Project alternatives could alter fuel consumption to a very slight degree. However, any change would be insignificant.

Therefore, neither the Future Baseline nor any of the Proposed Project Alternatives would result in the depletion of local supplies of energy and/or natural resources.

4.12 HAZARDOUS MATERIALS, POLLUTION PREVENTION, SOLID WASTE, AND CONSTRUCTION IMPACTS

Neither the Future Baseline nor any of the Proposed Action Alternatives involve construction activity. Therefore, there would be no impacts with regard to construction activity, hazardous materials, or solid waste. As such, there is no need to address pollution prevention.

4.13 WATER QUALITY, WETLANDS, AND FLOODPLAINS

Neither the Future Baseline nor any of the Proposed Action Alternatives would result in the development of facilities. Therefore there would be no impacts with respect to water quality, wetlands, or floodplains.

4.14 COASTAL RESOURCES

The project area is not located in a coastal zone or included in a Coastal Zone Management Program. Therefore there would be no impacts with respect to coastal resources.

4.15 FARMLANDS

Neither the Future Baseline nor any of the Proposed Action Alternatives would result in the development of facilities. Therefore there would be no impacts with respect to farmlands.

CHAPTER V – LIST OF PREPARERS

FAA CENTRAL TERMINAL SERVICE AREA

Annette Davis
Education: B.S. Biology
Years of Experience: 25
Role: FAA Project Manager

NORTHROP GRUMMAN

Michael Merrill
Education: M.S. Civil/Environmental Engineering
B.S. Electrical Engineering Technology
Years of Experience: 20
Role: Project Manager

Michael T. Johnson
Education: B.S. Air Commerce, Transportation Technology
Years of Experience: 22
Role: Document Development

Adam Mouw
Education: M.B.A. - In progress
M.S. Organismic and Evolutionary Biology
B.A., Biology/Environmental Science
Years of Experience: 8
Role: Document Development

LANDRUM AND BROWN

Scott D. Carpenter
Education: B.S. Electronics Engineering Technology
Years of Experience: 18
Role: L&B Project Manager, Manager – Noise Analysis

Mark R. Heusinkveld, CPA
Education: M.B.A.
B.B.A Accounting
Years of Experience: 16
Role: Manager of Aviation Activity Forecasts

Stan Eshelman
Education: B.S. Mathematics/Chemical Engineering
Years of Experience: 3
Role: Noise Analysis

Sarah Potter
Education: B.A. Mathematics
Years of Experience: 5
Role: Noise Analysis

METRON AVIATION

Michael Graham
Education: B.S. Computer Science
Years of Experience: 17
Responsibility: Satellite noise modeling

Tyler White
Education: BS Computer Science
Years of Experience: 4
Responsibility: Satellite noise modeling

EVENTWORKS

Rich Mauch
Education: B.S. Management,
Years of Experience: 20
Responsibility: Event Management

Ellen Basile
Education: M.Ed. Sport and Recreation Administration
B.A. English
Years of Experience: 11
Responsibility: Event Coordinator

CHAPTER VI – REFERENCES

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CHAPTER VII – LIST OF ABBREVIATIONS, ACRONYMS, AND GLOSSARY

7.1 LIST OF ACRONYMS AND ABBREVIATIONS

AFE Above Field Elevation

AGL Above Ground Level

ALN St. Louis Regional

ANSI American National Standards Institute

APO Office of Aviation Policy and Plans

ARTCC Air Route Traffic Control Center

ARTS Automated Radar Terminal System

ATA Arrival-Transition-Areas

ATC Air Traffic Control

ATCT Airport Traffic Control Tower

BLV Mid-America

CEQ Council on Environmental Quality

CFR Code of Federal Regulations

CO Carbon Monoxide

COG Council of Governments

CPS St. Louis Downtown

CTAP Chicago Terminal Airspace Project

dB Decibel

dBA A-Weighted Decibel

dBC C-Weighted Decibel

DEIS Draft Environmental Impact Statement

DNL Day-Night Average Sound Level

DOD Department of Defense (United States)

DOT Department of Transportation (United States)

DP Departure Procedure

EA Environmental Assessment

EDMS Emissions and Dispersion Modeling System

EECP Expanded East Coast Plan

EIS Environmental Impact Statement

EPA Environmental Protection Agency (United States)

FAA Federal Aviation Administration

FEMA Federal Emergency Management Agency

FICON Federal Interagency Committee on Noise

FICUN Federal Interagency Committee on Urban Noise

FL Flight Level

FMS Flight Management Systems

FPPA Farmland Protection Policy Act

FY Fiscal Year

GA General Aviation

GPS Global Positioning System

HC Hydrocarbon

HUD Department of Housing and Urban Development (United States)

Hz Hertz

IAP Instrument Approach Procedures

IFR Instrument Flight Rules

ILS Instrument Landing System

IMC Instrument Meteorological Conditions

INM Integrated Noise Model

INS Inertial Navigation System

LAEQ See Leq(24)

LAEQD Equivalent Sound Level during the daytime (7 a.m. to 10 p.m.)

LAEQN Equivalent Sound Level during the nighttime (10 p.m. to 7 a.m.)

Leq(24) 24-hour Equivalent Sound Level

Lmax Maximum A-weighted Sound Level

LAAS Local Area Augmentation System

LAMAX See Lmax

MSL Mean Sea Level

NAAQS National Ambient Air Quality Standards

NAS National Airspace System

NAVAID Navigation Aid

NDB Non-Directional Beacon

NEPA National Environmental Policy Act

NIRS Noise Integrated Routing System

NM Nautical Mile

NO2 Nitrogen Dioxide

NOAA National Oceanographic and Atmospheric Administration

NOx Nitrogen Oxides

NOI Notice of Intent

NRHP National Register of Historic Places

O3 Ozone

OEP Operational Evolution Plan

ORD Chicago O'Hare International Airport

PM-10 Particulate Matter less than 10 micrometers in diameter

RNAV Area Navigation

ROD Record of Decision

SEL Sound Exposure Level

SHPO State Historic Preservation Officer

SIP State Implementation Plan

SM Statute Mile

SO2 Sulfur Dioxide

SPL Sound Pressure Level

STAR Standard Terminal Arrival Route

SUS Spirit of St. Louis

TA Time Above

TAAM Total Airspace & Airport Modeler Plus

TACAN Tactical Air Navigation

TAF Terminal Area Forecast

TALA See Time Above

TERPS Terminal Instrument Procedures

TRACON Terminal Radar Approach Control

TSC Transportation Steering Committee

USAF United States Air Force

USFWS United States Fish and Wildlife Service

VHF Very High Frequency

VFR Visual Flight Rules

VMC Visual Meteorological Conditions

VOC Volatile Organic Compound

VOR VHF Omni-directional Radio Range Station

VORTAC VHF Omni-directional Range with Tactical Air Navigation

7.2 GLOSSARY OF TERMS

A-Weighted Sound Level – A quantity, in decibels, read from a standard sound-level meter with A-weighting circuitry. The A-weighting scale discriminates against the lower frequencies below 1000 hertz according to a relationship approximating the auditory sensitivity of the human ear. The A-weighted sound level is approximately related to the relative "noisiness" or "annoyance" of many common sounds.

Acoustics – The science of sound, including the generation, transmission, and effects of sound waves, both audible and inaudible.

Air Carrier – An entity holding a Certificate of Public Convenience and Necessity issued by the Department of Transportation to conduct scheduled air services over specified routes and a limited amount of non-scheduled operations.

Air Pollutant – Any substance in air that could, in high enough concentration, harm man, other animals, vegetation, or material. Pollutants may include almost any natural or artificial composition of airborne matter capable of being airborne. They may be in gases, particulates, or in combinations thereof. Generally, they fall into two main groups: (1) those emitted directly form identifiable sources and (2) those produced in the air by interaction between two or more primary pollutants, or by reaction with normal atmospheric constituents, with or without photoactivation.

Air Route Traffic Control Center (ARTCC) – An FAA facility established to provide air traffic control service to aircraft operating on an IFR flight plan within controlled airspace and principally during the en-route phase of flight. When equipment capabilities and controller workload permit, certain advisory/assistance services may be proved to VFR aircraft.

Air Taxi – An air carrier certificated in accordance with Part 135 and authorized to provide, on demand, public transportation of persons and property by aircraft. Generally operates small aircraft "for hire" for specific trips.

Air Traffic Control (ATC) – A service operated by appropriate authority to promote the safe, orderly, and expeditious flow of air traffic.

Airman's Information Manual – A publication containing basic flight information and ATC procedures designed primarily as a pilot's information and instructional manual for use in the National Airspace System.

Airport Traffic Control Tower (ATCT) – A facility that uses air/ground communications, visual signaling, and other devices to provide ATC services to aircraft operating in the vicinity of an airport. Authorizes aircraft to land or take-off at the airport controlled by the tower regardless of flight plan or weather conditions.

Airspace – Navigable area used by aircraft for purposes of flight.

Airway – A control area or portion of established in the form of a corridor, the center line of which is the defined by radio navigational aids. The network of airways serving aircraft operations up to but not including 18,000 feet MSL are referred to as "Victor" airways. The network of airways serving aircraft operations at or above 18,000 feet MSL are referred to as "Jet " airways.

Altitude – Height above a reference point, usually expressed in feet. Reference points are typically sea level, the ground, or airfield elevation in which case MSL, AGL or AFE further describes the altitude, respectively.

Ambient Noise Level – The level of noise that is all-encompassing within a given environment for which a single source cannot be determined. It is usually a composite of sounds from many and varied sources near to and far from the receiver.

Area Navigation (RNAV) – A method of navigation that permits aircraft operation on any desired course within the coverage of station-referenced navigation signals or within the limits of a self-contained system capability.

Arithmetic Averaged Sound Pressure Level – The arithmetic sum of a series of sound pressure levels divided by the number of levels included in the sum.

Arrival Stream – A flow of aircraft that are following similar arrival procedures.

Automated Radar Terminal System (ARTS) – Computer-aided radar display subsystems capable of associating alphanumeric data-such as aircraft identification, altitude, and airspeed-with aircraft radar returns.

Attainment Area – An area in which the Federal or state standards for ambient air quality are being achieved.

Azimuth – An arc of the horizon measured between a fixed point (as true north) and the vertical circle passing through the center of an object.

Block – Census blocks are small areas bounded on all sides by visible features such as streets, roads, streams, and railroad tracks, and by invisible boundaries such as city, town, township, and county limits; property lines; and short, imaginary extensions of streets and roads. Blocks are numbered uniquely within each census tract or block numbering area (BNA). A three-digit number identifies a block, sometimes with a single alphabetical suffix. The U.S. Bureau of Census designates census blocks.

Centroid – A point representing the geographic center of a US Bureau of Census census block.

Clearance – see Air Traffic Clearance.

Climb – The act or instance of increasing altitude.

Conformity – A determination that a project conforms with a State Implementation Plan (SIP) whose purpose is to eliminate or reduce the severity and number of violations of the National Ambient Air Quality Standards; and does not impede the scheduled attainment of such standards.

Controlled Airspace – Airspace of defined dimensions within which air traffic control service is provided to IFR flights and to VFR flights in accordance with the airspace classification.

Corner Post – An airspace structure wherein arriving aircraft are routed to one of four arrival fixes located at the corners of the TRACON airspace, at approximately 90-degrees from one another. A straight track from the arrival fix to the major airport is used to route arriving aircraft; therefore, there are four primary arrival routes in a corner post system. Departing aircraft are routed via several departure routes that use the airspace between the arrival routes. This effectively segregates arriving and departing aircraft into different sections of airspace.

Cost-Benefit Analysis – A means of quantitatively evaluating all benefits and costs incurred throughout a project's economic life.

Criteria Pollutants – The 1970 amendments to the Clean Air Act required EPA to set National Ambient Air Quality Standards for certain pollutants known to be hazardous to human health. EPA has identified and set standards to protect human health and welfare for six pollutants: ozone, carbon monoxide, total suspended particulates, sulfur dioxide, lead, and nitrogen oxide. The term, "criteria pollutants" derives from the requirement that EPA must describe the characteristics and potential health and welfare effects of these pollutants. It is on the basis of these criteria that standards are set or revised.

***de minimis* Levels** – *de minimis* levels are levels and vary according to the type of pollutant and severity of the non-attainment area. These levels are consistent for all conformity determinations (unless the State chooses to set lower *de minimis* levels and apply the conformity requirements to non-federal as well as Federal entities). The calculation of total project emissions is made and compared to these *de minimis* cutoffs. If the emissions for a pollutant are above *de minimis*, the project requires a conformity determination. All emissions from the project must be analyzed and found to conform, not only those above the *de minimis* levels.

Departure – The act of an aircraft taking off from an airport.

Departure Procedure (DP) – A preplanned IFR ATC departure procedure printed for pilot use in graphic and/or textual form. DP's provide transition from the terminal to the appropriate en route structure.

Descent – The process of decreasing altitude.

Distance Measuring Equipment (DME) – Equipment (airborne and ground) used to measure, in nautical miles, the slant-range distance of an aircraft from the DME navigational aid.

Day-Night Average Sound Level (DNL) – A measure of the annual average noise environment over a 24-hour day. It is the 24-hour, logarithmic- (or energy-) average, A-weighted sound pressure level with a 10-decibel penalty applied to the nighttime event levels that occur between 10 p.m. and 7 a.m.

Decibel (dB) – Commonly used to define the level produced by a sound source. The term used to identify 10 times the common logarithm of two like quantities proportional to power, such as sound power or sound pressure squared.

Downwind – in the direction in which the wind blows; with the wind behind.

Emissions – Pollution discharged into the atmosphere from stationary sources such as smokestacks, surface areas of commercial or industrial facilities, residential chimneys, and from mobile sources such as motor vehicles, locomotives, or aircraft exhausts.

Energy-Averaged Sound Pressure Level – The logarithmic sum of the sound power of a series of sound pressure levels divided by the number of levels included in the sum.

Enplanement – the total number of revenue passengers boarding aircraft, including originating, stopover, and transfer passengers, in scheduled and non-scheduled services.

En Route Airspace – A general term to describe the airspace controlled by an ARTCC.

Environmental Impact Statement (EIS) – An EIS is a document that provides a discussion of the significant environmental impacts which would occur as a result of a proposed project, and informs decision-makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts. Public participation and consultation with other federal, state, and local agencies is a cornerstone of the EIS process.

Environmental Noise – Unwanted sound from various outdoor sources that produce noise. Environmental noise sources include aircraft, cars, trucks, buses, railways, industrial plants, construction activities, etc.

Equivalent Sound Level (Leq, LAEQ, LAEQD or LAEQN) – The level of a constant sound which, in the given situation and time period, has the same average sound energy, as does a time-varying sound. Specifically, equivalent sound level is the energy-averaged sound pressure level of the individual A-weighted sound pressure levels occurring during the time interval. The time interval over which the measurement is taken (or for which the metric is computed) should always be specified. For example, if the time interval is the daytime period (7 a.m. to 10 p.m.) then the acronym LAEQD is used. Similarly, if the time interval is the nighttime period (10 p.m. to 7 a.m.) then the acronym LAEQN is used.

Expanded East Coast Plan (EECP) – A comprehensive revision (prepared in 1986 and implemented in stages) of IFR routes and procedures above 3,000 feet. The plan was designed, to restructure routes to and from the New York metroplex to complement improved terminal ATC procedures, to reduce delays, to adjust arrival and departure corridors and facilitate air traffic management.

Federal Aviation Administration (FAA) – The Federal Aviation Administration (FAA) is the element of the United States government with primary responsibility for the safety of civil aviation. Among its major functions are the regulation of civil aviation to promote safety and fulfill the requirements of national defense and development and operation of a common system of air traffic control and navigation for both civil and military aircraft.

Federal Airway – see Airway

Filed Altitude – The initial altitude filed on the flight plan.

Fix – A geographical position determined by reference to the surface, by reference to one or more NAVAIDs or area navigation (RNAV) (including GPS).

Flight Data Information – Specific information used by ATC for an individual flight. This includes information such as aircraft identification, destination, type, route, and altitude.

Flight Data Processing System – The system used to store and track flight data information.

Flight Level (FL) – A level of constant atmospheric pressure related to reference datum of 29.92 inches of mercury. Each FL is expressed in three digits representing hundreds of feet. For example FL 250 represents a barometric altitude of 25,000 feet. Aircraft operating at altitudes greater than 18,000 feet MSL in the United States use Flight levels as their altitude reference.

Flight Management System (FMS) – A computer system that contains a database of NAVAIDS, fixes, IAPs, and airports that allows routes to be preprogrammed. The system is constantly updated with respect to position accuracy (x, y, and z coordinates) by reference to conventional navigational aids.

Flight Track – The route used by an aircraft in flight.

Flight Track Utilization – The amount and type of aircraft that use a specific flight track, on either departure or arrival.

Frequency (acoustic) – The number of oscillations per second completed by a vibrating object.

Gates – see Ingress/Egress Transfer Points

General Aviation (GA) – All civil aviation except scheduled passenger and cargo airlines.

Global Positioning System (GPS) – A satellite-based radio positioning and navigation system operated by the Department of Defense. The system provides highly accurate position and velocity information, and precise time, on a continuous global basis to an unlimited number of properly equipped users.

Hand-Off – An action taken to transfer the radar identification of an aircraft from one controller to another if the aircraft will enter the receiving controller's airspace and radio communications with the aircraft will be transferred.

Heading – A compass bearing indicating the direction of travel.

Hertz (Hz) – The unit used to designate frequency; specifically, the number of cycles per second.

Household – A household includes all the persons who occupy a housing unit. The occupants may be a single family, one person living alone, two or more families living together, or any other group of related or unrelated persons who share living arrangements.

Housing Unit – A housing unit is a house, apartment, a mobile home or trailer, a group of rooms or a single room occupied as separate living quarters or, if vacant, intended for occupancy as separate living quarters.

Hub – Airport that serves as a focus of an air carrier's route structure. Flights from many cities converge at the focal airport permitting passengers to connect to other points in the route structure. See also Hubbing.

Hubbing – The practice of having a large number of aircraft (from a single carrier) arrive at the "hub" airport during a compressed time frame. Passengers are exchanged between aircraft to various destinations and all aircraft depart within a compressed time period.

Hydrocarbons (HC) – Chemical compounds that consist entirely of carbon and hydrogen.

Ingress/Egress Transfer Points – A fix used by ATC to transfer control of aircraft from one facility's area of jurisdiction to another facility's area of jurisdiction. (i.e., ARTCC to TRACON).

Instrument Approach Procedure (IAP) – A series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight conditions from the beginning of the initial approach to a landing or to a point from which a landing may be made visually.

Instrument Flight Rules (IFR) – Rules governing the procedures for conducting instrument flight. Also a term used by pilots and controllers to indicate type of flight plan.

Instrument Meteorological Conditions (IMC) – Weather conditions expressed in terms of visibility, distance from clouds, and cloud ceilings during which all aircraft are required to operate using Instrument Flight Rules (IFR).

Integrated Noise Model (INM) – A computer program developed, updated and maintained by the Federal Aviation Administration to evaluate aircraft noise impacts in the vicinity of airports.

Inter-Facility Boundary – Boundary of two adjacent ATC facilities.

Intra-Facility Boundary – Internal boundary in a ATC facility (i.e., a sector wall).

In-Trail Spacing – The distance between two aircraft on an identical route; one aircraft is following another.

Invasive Species – Invasive species are organisms (usually transported by humans) which successfully establish themselves in, and then overcome, otherwise intact, pre-existing native ecosystems.

Jet Stream – A migrating stream of high speed winds present at high altitudes.

Knots – Speed measured in nautical miles per hour.

Level Off – The process by which an aircraft that is initially changing altitude maintains a constant altitude. This can be done once the aircraft reaches its cruise altitude in the en route environment, or as a series of steps taken as the aircraft transition to/from the en route environment to guarantee adequate separation from other aircraft.

Loudness – The attribute of an auditory sensation, in terms of which sounds may be ordered on a scale extending from soft to loud. Loudness depends primarily upon the sound pressure of the source, but it also depends upon the frequency and waveform of the source.

Mean Sea Level (MSL) – The height of the surface of the sea for all stages of the tide, used as a reference for elevations. Also called sea level datum.

Mean Surface Wind Speed – Average wind velocity calculated at the surface or at ground level elevation.

National Airspace System (NAS) – The NAS is the common network of air navigation facilities, equipment and services, airports or landing areas; aeronautical charts, information and services; rules, regulations and procedures, technical information, and manpower and material.

National Ambient Air Quality Standards (NAAQS) – Standards for criteria pollutants established by United States Environmental Protection Agency that apply to outdoor air.

Natural Areas – Undeveloped areas of land such as parks, wildlife refuges/management areas, and nature preserves.

Nautical Mile (NM) – A measure of distance equal to 1 minute of arc on the earth's surface (approximately 6,076 feet).

Navigation Aids (NAVAIDs) – Any visual or electronic device airborne or on the surface which provides point to point guidance information or position data to aircraft in-flight.

Noise – Any sound that is undesirable because it interferes with speech and hearing, or is intense enough to damage hearing, or is otherwise annoying.

Noise Abatement Procedure – Measures taken to reduce the off-airport impacts of aircraft noise. Procedures developed by airport operators in cooperation with the FAA, and local community officials, to mitigate aircraft noise near airports.

Noise Exposure – The cumulative acoustic stimulation reaching the ear of a person over a specified period of time (e.g., a work shift, a day, a working life, or a lifetime).

Noise Integrated Routing System (NIRS) – A computer program developed, updated, and maintained by the Federal Aviation Administration to evaluate aircraft noise impact for air traffic actions involving multiple airports over broad geographic areas.

Non-Attainment Area – Areas with levels that exceed one or more of the National Ambient Air Quality Standards for the criteria pollutants designated in the Clean Air Act.

Operation – Landing or take-off of an aircraft.

Over-flights – Aircraft whose flights originate or terminate outside the controlling facility's area that transit the airspace without landing.

Piston Driven Aircraft – Propeller driven aircraft powered by an internal combustion engine.

Positive Control – The separation of all air traffic within designated airspace by air traffic control.

Power Settings – Amount of engine power used by the pilot.

Quadrant – A quarter part of a circle, centered on a NAVAID oriented clockwise from magnetic north.

Radar (primary) – A device which, by measuring the time interval between transmission and reception of radio pulses, and correlating the angular orientation of the radiated antenna beam, or beams in azimuth and/or elevation, provides information on range, azimuth, and /or elevation of objects in the path of the transmitted pulses. Also known as Primary Radar.

Radar (secondary) – A radar system in which the object to be detected is fitted with cooperative equipment in the form of a radio receiver/transmitter (transponder). Radar pulses transmitted from the searching transmitter/receiver (interrogator) site are received in the cooperative equipment and used to trigger a distinctive transmission from the transponder. This reply transmission, rather than a reflected signal, is then received back at the interrogator site for processing and display at an ATC facility. Also known as a radar beacon.

Radial – A magnetic bearing extending from a VOR/VORTAC/TACAN navigation facility.

Receiver – The listener or measuring microphone that detects the sound transmitted by the source.

Satellite Navigation – see Global Positioning System

Sector – A defined volume of airspace, including both lateral and vertical limits, in which a single air traffic controller is responsible for the safe movement of air traffic. A TRACON's or ARTCC's airspace is comprised of multiple sectors.

Scoping – The early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action. Scoping is also used to eliminate from detailed study the issues that are not significant or have been covered by prior environmental review.

Separation – Spacing between aircraft. This spacing may be vertical, lateral, longitudinal and visual.

Sequencing – Procedure in which air traffic is merged into an orderly flow.

Silent Hand-offs – Transfer of control from one air traffic controller to another by electronic means only. No voice communications are used.

Sound Exposure Level (SEL) – A time-integrated metric (i.e., continuously summed over a time period) which quantifies the total energy in the A-weighted sound level measured during a transient noise event. The time period for this measurement is generally taken to be that between the moments when the A-weighted sound level is 10 dB below the maximum.

Sound Pressure Level – A measure, in decibels, of the magnitude of the sound. Specifically, the sound pressure level of a sound that, in decibels, is 10 times the logarithm to the base 10 of the ratio of the squared pressure of this sound to the squared reference pressure. The reference pressure is usually taken to be 20 micropascals. (See also Energy-Averaged Sound Pressure Level.)

Source (acoustic) – The object that generates the sound.

Standard Terminal Arrival (STAR) – A preplanned instrument flight rule (IFR) air traffic control arrival procedure published for pilot use in graphic and/or textual form. STAR's provide transition from the en route structure to an outer fix or an instrument approach fix/arrival waypoint in the terminal area.

Statute Mile (SM) – A measure of distance equal to 5,280 feet.

Sulfur Dioxide (SO2) – Sulfur dioxide typically results from combustion processes, refining of petroleum, and other industrial processes.

Tactical Air Navigation (TACAN) – An ultra high frequency electronic air navigation aid which provides equipped aircraft a continuous indication of bearing and distance to the station.

Terminal Area – A general term used to describe airspace in which approach control services for airport traffic control service is provided.

Terminal Radar Approach Control (TRACON) – An FAA ATC facility which uses radar and two way radio communication to provide separation of air traffic within a specified geographic area in the vicinity of one or more large airports.

Time Above (TA or TALA) – The TA noise metric provides the duration in minutes for which aircraft-related noise exceeded a specified A-weighted sound level. If not stated otherwise, TA pertains to a 24-hour day. For example, a TA65 (or TALA65) of 17 minutes means that 65 dB was exceeded for a total of 17 minutes of the course of a 24-hour day.

Topography – The configuration of a surface including its relief and the position of its natural and man made features.

Tower – see Airport Traffic Control Tower

Transfer Points – see Ingress/Egress Transfer Points

Transition Area – see Controlled Airspace

Transport Category Aircraft – Aircraft certified in accordance with 14 C.F.R. Part 25.

Turboprop Aircraft – An aircraft whose main propulsive force is provided by a propeller driven by a gas turbine. Additional propulsive force may be provided by gas discharged from the turbine exhaust.

Vector – Heading instructions issued by ATC to provide navigational guidance by radar.

Visual Meteorological Conditions (VMC) – Weather conditions expressed in terms of visibility, distance from cloud, and ceiling equal to or better than specified minima.

Visual Flight Rules (VFR) – Rules that govern the procedures for conducting flight under visual conditions. The term 'VFR' is also used in the United States to indicate weather conditions that are equal to or greater than minimum VFR requirements. In addition, it is used by pilots and controllers to indicate type of flight plan.

Volatile Organic Compound (VOC) – Any organic compound that participates in atmospheric photochemical reactions except those designated by EPA as having negligible photochemical reactivity.

VOR (Very High Frequency Omni-directional Radio Range Station) – A ground-based electronic navigation aid transmitting very high frequency navigation signals, 360° in azimuth, oriented from magnetic North. DME may be installed. Used as a basis for navigation in the National Airspace System.

VORTAC (Very High Frequency Omni-directional Range with Tactical Air Navigation) – A navigation aid providing VOR azimuth, TACAN azimuth, and TACAN distance measuring equipment (DME) at one site. The most common form of radio navigation currently in use.

Wake Turbulence – Phenomena resulting from the passage of an aircraft through the atmosphere. The term includes vortices, thrust stream turbulence, jet blast, jet wash, propeller wash, and rotor wash both on the ground and in the air.

Weighting – An additive (or subtractive) factor by which the sound pressure level at certain frequencies in an acoustic measurement is increased (or reduced) in order for that measurement to be more representative of certain simulated conditions.